SCIENTIFIC AMERICAN

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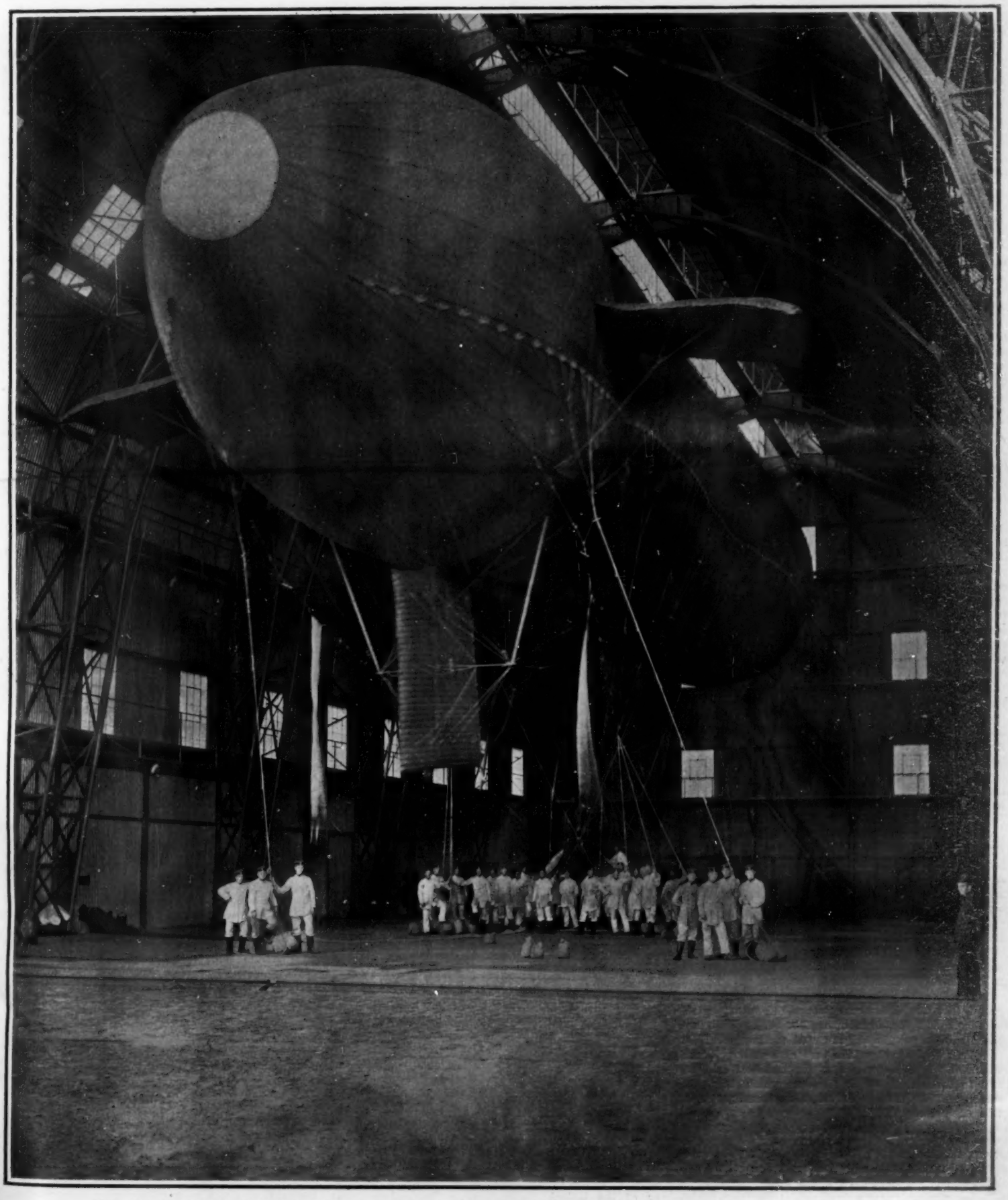

End view of Parseval airship in its shed, showing the stabilizing fans at the sides of the envelope and the vertical rudder beneath.

THE PARSEVAL AIRSHIP.—[See page 124.]

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ESTABLISHED 1845

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NEW YORK, SATURDAY, AUGUST 13th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

OUR IGNORANCE OF WIND PRESSURE.

IN view of the great size of modern engineering and architectural structures, and the vast areas which they expose to the wind, it is strange that our knowledge of wind pressure, both as to its amount for given velocities and its action on surfaces of different form, should be comparatively limited and uncertain. The subject of wind pressure is of the first importance; for in some framed structures, such as bridges, roofs, etc., cases have occurred in which the calculations have shown that the wind stresses have been greater than those arising from the weight of the structure itself or of the load which it carries. As an instance of the magnitude of the pressures to which exposed surfaces are liable, we refer to our recent discussion of a large sign, 60 by 90 feet in area, erected above a hotel in this city, which in a gale of wind is liable to experience a maximum pressure of no less than 94½ tons.

Our present knowledge regarding wind pressure on exposed surfaces is largely based on certain observations by the late Sir Benjamin Baker, taken prior to and during the erection of the Forth Bridge, Scotland. Mr. Baker provided a large surface, which was so supported that not only was the total pressure on the whole surface automatically recorded, but, by means of pressure gages, any local excesses of pressure on smaller areas of the board were separately recorded. The data thus gathered established the hitherto unsuspected fact that a strong wind does not blow with even intensity, but is composed of masses of air moving with varying velocity and exerting varying pressures. It was established, or rather assumed, on this basis, that a small structure such as a 100-ft. county bridge was liable to be exposed over its whole surface to a much higher unit pressure than a 1,710-ft. span like those composing the Forth Bridge. The British Government regulations required that bridge to be built for an average pressure of 56 lbs. per square foot, but Sir Benjamin's experiments proved, or rather suggested, that while this might be advisable for a short bridge, it was too high for a bridge of great length. Hence, bridge engineers are now using for long-span bridges a uniform pressure of 30 to 35 lbs. per square foot. In the interests of safe engineering, however, it is desirable that the data secured by Baker be amplified, and their truth further established, by more elaborate investigations carried on at different locations, and for longer periods of time.

Another branch of this subject which calls for additional investigation is the question of the pressure of the wind on inclined and on curved and irregular surfaces. We all know that the wind pressure is less on a cylindrical column than it is on a square column of equal projected area. One experimentalist found that the difference was in the ratio of two to three; but the data upon this subject also are based upon a too limited range of observation. Here is a field of research of the very highest importance, which should be attractive to our technical colleges, and to those scientific institutions which have the means and the time to devote to an investigation of this character.

THE "ERBSLOEH" DISASTER.

FOR the second time in the history of aeronautics an airship has burst and all its passengers have been killed, merely because its mechanism was deranged. Both these frightful accidents happened to dirigibles of the semi-rigid type. In the case of the "Republique" a year ago, the disaster was caused by the flying blade of a broken propeller, which tore a comparatively small rent in the gas bag. In the case of "Erbsloeh," a still slighter rent from an excess of internal pressure during a rapid heating and expanding of the gas, proved fatal. For the ship suddenly entered hot July sunshine after a long trip in a dense cold mist, and quickly rose.

That the "Erbsloeh" exploded directly because of gas expansion is shown by the fact that the catastrophe did not occur at the apex of its ascent, but after the vessel had been again steered down, as proved by the intact barogram and by the notes of one of the passengers.

The engineer who piloted the "Ruthenberg" semi-rigid dirigible during its 25 trips at the Frankfurt aeronautical exposition last year has stated that he repeatedly found the automatic safety valve unequal to the task of sufficiently relieving a rapid increase of the gas pressure, and that he had to watch the monometer closely, and eventually pull the valve cord. He ascribes the fate of the "Erbsloeh" to a derangement of the monometer.

Major von Parseval, in a lecture on his own system, commented on the "Republique" disaster: "If the gas bag of a semi-rigid airship is torn from any cause, the stiffening frame is liable to become an element of grave danger. Its unrelenting pull on a deflating envelope with the gas floating hither and thither will be so irregular and spasmodic, that almost nothing can save the cloth from being ripped from top to bottom. The whole front end of the 'Republique's' balloon was thus torn loose with a dull report, and to judge from the noise heard by farmers before the frame plunged down from the clouds the 'Erbsloeh' must have suffered a similar disruption."

This repetition of a frightful accident seems to point to the fact that in a way the semi-rigid "hybrid" system is an impossible compromise. This was the view of the late Lieutenant Colonel Moedebeck even before these accidents had happened.

When the gas bag loses its shape it would seem necessary that the frame should become flexible, too (as it actually does to some extent in the Gross-Bosevach system, where it is divided into three pliably connected parts).

The semi-rigid system was only recently tried out by the difficulties and damaging of the "Gross III.," while at anchor in a storm. It was then shown that a semi-rigid vessel is more or less burdened with the disadvantages of both the non-rigid and the rigid system. Its only strong point is its capacity for high speed and its comparatively small displacement, a factor which led naturally to its early development. But in the light of the "Erbsloeh" disaster it is becoming apparent that the Parseval and the Zeppelin both embody the right principle of providing for a strong envelope. Their stiffness is due to the hull itself. Von Parseval gains this stiffness indirectly by making the cloth of a bag under pressure specially heavy; Count Zeppelin makes his stiffening frame serve as a double "setting" of unlimited strength for a row of gas bags, and his type is therefore proof against collapse such as befell the "Erbsloch," so long as it is preserved from violent contact with the ground.

But in a semi-rigid airship the strength of the frame in no way relieves internal stresses on the envelope. To provide for its weight necessitates a lighter gas bag as compared to a Parseval, and in emergencies it even becomes a menace.

SUBMARINES AS SEAGOING VESSELS.

WE do not hesitate to say that the most important fact, to-day, in the development of naval material is the surprisingly rapid improvement of the submarine. A few enthusiasts have been struggling with the seemingly unconquerable difficulties of submarine navigation with such success that at last they have produced an engine of warfare, in the presence of whose latest performances even the most conservative among us must ask whether the supremacy of the big battleship is not most seriously threatened.

The submarine of to-day is a very different craft from its progenitor of ten or a dozen years ago. Particularly is this true of the type which has been developed for the United States Navy, the latest representatives of which are seagoing vessels possessing fair speed, a wide radius of action, and great certainty of control both at the surface, in making the dive, and when running submerged. Furthermore, thanks to the bold initiative of the builders, the latest navy submarines, built at the Fall River Works and represented by the "Salmon," have demonstrated by her bold ocean voyage of 1,500 miles to Bermuda and back, that the time is coming when the submarine will be able to accompany a battleship fleet upon the high seas.

In fitting the "Salmon" for this cruise, no special navigating bridge was provided. The vessel was navigated by Mr. G. C. Davidson, late lieutenant commander of the United States Navy. The underwriters required that a convoy should be taken, and the "Salmon" was therefore accompanied by the tug "Underwriter," which rendered no assistance whatever to the submarine on the seven hundred and eighteen mile run to Bermuda.

The "Salmon" is 134½ feet long by 15 feet in diameter. When running at the surface she displaces 230 tons and in the submerged condition her displacement is 345 tons. On her official surface speed trials she made 13¼ knots and she averaged 12¼ knots on her 24-hour surface trial at sea. In diving, she first sinks to the submerged condition by admitting water to her ballast tanks, and then, with a reserve bouyancy of 1,250 pounds, a slight depression of the diving rudder causes the boat to dive with remarkable steadiness at an angle of inclination of from one to two and a half degrees, until the required depth of 15 feet is reached, when the whole hull is submerged and nothing but the slender tubes containing the periscopes is visible. The "Salmon" has effected a quick dive, from a full speed of 13¼ knots on the surface under oil engines, with ballast tanks empty, to submerged running with the electric motors at 9 knots in 3 minutes, 22 seconds. During a five hours trip below the water in a vessel of this kind the writer was greatly impressed with the steadiness with which the dive was made, and the ease with which the submarine was held at the desired depth, and maneuvered either in the vertical or horizontal plane.

At the beginning of the run to Bermuda the "Salmon" carried its normal gasoline supply of 6,000 gallons, besides 385 gallons of lubricating oil, 1,085 gallons of fresh water, and 700 pounds of rations for twenty-one men for seven days. The "Salmon" got under way at Provincetown, Mass., at 9 P. M., on July 6th, and proceeded to Hamilton, Bermuda, at a speed of 10 knots. On the following day she ran into a strong southwest wind and rough sea, which lasted two days; and during this time she was navigated from the upper bridge, except from 1:30 P. M. until midnight on Friday, when she was navigated from inside the conning tower. A defective cylinder-head gasket on the port engine necessitated running the craft from Thursday to Saturday under the starboard engine alone, at a speed of 7½ knots. Sea-sickness on the part of the green engineering force of landsmen necessitated delaying repairs until port was reached.

The distance run from Provincetown was 718 miles and the average speed maintained was 7.8 knots, notwithstanding the fact that very heavy weather was encountered for over half the trip, and that for three-quarters of the time the vessel was proceeding under one engine. The total distance of the trip from Quincy was 768 nautical miles; the consumption of gasoline was 3,000 gallons, and of lubricating oil 95 gallons. While in Bermuda no repairs were made to the engine or other machinery, except the renewal of the gaskets in the cylinder heads.

The "Salmon" left Bermuda for Quincy, Mass., at 9:30 A. M. Wednesday, July 13th, and reached Provincetown at 3:40 Saturday, the 16th. During the voyage back both engines functioned satisfactorily and an average speed of 9.7 knots was maintained. At 1 P. M., while off Cape Cod, the gasoline supply was exhausted and a tow was taken until 3:45 P. M., when the boat proceeded to Provincetown under its electrical motors. This tow was taken as a matter of convenience, since the storage batteries were fully charged and they are sufficient to drive the vessel 150 miles under the surface. On examination it was found that accidentally one-half of the gasoline supply had been blown overboard.

The total run on this record-breaking cruise (for no such voyage out into the Atlantic had ever been attempted before) was 1,514 miles. The average speed for the whole cruise was 8.7 knots. The gasoline consumed shows a radius of 1,536 miles under the adverse conditions of the outward trip, and a radius of about 1,650 miles under the more favorable conditions of the return trip.

The habitability of the boat was thoroughly demonstrated, even when carrying passengers in excess of her crew through very rough weather, during which the green crew was seasick. The ventilation of all parts of the boat, except the torpedo compartment, was satisfactory. The torpedo compartment has not, as in later boats, any means of supplying fresh air, and the ventilation, therefore, was poor, particularly in view of the fact, that the cooking was done in this compartment; an operation which in later boats is performed in the after battery compartment, which has perfect ventilation from the engines. While at sea the temperature of the air outside and in the body of the boat was about 80 deg. The engine room temperature varied from 100 to 110 deg.

This Bermuda cruise disposes of the doubt that the submarine can ever be regarded as a seagoing craft. Hitherto it has been looked upon as a mere adjunct to the system of harbor defences; and its value has been set down as due mainly to its "moral effect." But to the naval man it is evident that an enlarged "Salmon," with its speed and radius greatly increased, will prove a formidable competitor of the battleship for the supremacy of the sea.

ENGINEERING.

During the year 1909, 3,748 miles of new track were built in the United States. This is an increase of five hundred and thirty-four miles over the year 1908, which was the year of least new construction since 1897, when 2,109 miles were built.

It is stated by the London Engineer that the military authorities have tested a new device for tracing the flight of shells during night firing. A metal cylinder, containing a powerful illuminant, is screwed to the base of the shell. This is fired by the explosion and continues to burn brightly during the flight of the projectile.

The Lehigh Valley Railway is about to instal a telephone service on its passenger trains running between New York and Buffalo. Messages to and from the outside world will be transmitted through wayside stations, which will use the telephone circuits of the railroad.

Electric operation of steam railroads has made a striking demonstration of its economic value during the two years operation of the St. Clair tunnel. As compared with steam operation, the substitution of electric power has made a reduction of 39 per cent in fuel consumption. There has been a reduction of 40 per cent in general operating expenses and the total cost of operation, including interest on the investment, etc., works out at about 85 per cent of the cost of operation by steam.

The authoritative data regarding the new thirty-two thousand ton battleship which is being built by Armstrong, Whitworth & Co. for the Brazilian Government have been made public. This monster vessel, which will be the largest battleship afloat, will be 655 feet over all, by 96 feet beam and 26 feet draft. She will mount twelve 14-inch guns, fourteen 6-inch and fourteen 4-inch guns. There will be three 18-inch underwater torpedo tubes. Turbine engines will drive her at 22½ knots, and in the complete condition she will have cost nearly fourteen million dollars.

At the recent international railway congress during the discussion of the best method of strengthening railway track, it was shown that the average length of rail employed in English-speaking countries varies from 30 to 40 feet; on the Continent and in Egypt, the average length is 59 feet, while rails of as great a length as 72 feet 2 inches are sometimes employed. The welding of rail joints found but few advocates. The increased length of the rail has given added importance to the question of providing suitable rail joints, and it was realized that some form of boltless joint is desirable, if not imperative, to properly take care of expansion and contraction.

It is gratifying to learn that twice during the past three months the Bureau of Public Health of Philadelphia has been able to report that no deaths occurred from typhoid fever for a whole week. During the month of June there were but thirteen deaths from this scourge as compared with six hundred and sixty-nine deaths during the corresponding month of 1906. Philadelphia has reason to be proud of the results gained through the adoption of filtered water, the deaths from typhoid having decreased steadily from 72.4 per one hundred thousand in 1906 to 21.2 per one hundred thousand in 1909. The indication are that the present year will show a still more striking fall in the death rate from this disease.

An interesting reminder of early canal days has recently been found in connection with the construction of the New York State Barge Canal. This is the unearthing of a memorial cup which commemorates the first boat to navigate the State canals from Seneca Lake to New York City, an event which occurred in November, 1823. The boat was built by two farmers near the head of Seneca Lake, to carry a boat load of wheat from that point to New York. Speaking of this craft, Cadwallader says, "Her timbers grew near where she was built; her proprietors were her architects; her cargo was the produce of the fields from whence she sprung, and she was navigated by those who cultivated them; her sails and rigging even, were emphatically of domestic manufacture, for they were grown, and made, at the home of her owners."

Owing to the heavy snow-slides in the Cascade Mountains last winter the American Great Northern Railway will build about one mile of new wooden snow sheds this year. According to the Engineering Record a change of alignment on about 6,000 feet of line will be made at Berne, the first station east of the Cascade Tunnel, which will not only improve the location, but will also avoid some of the points where there have been bad snow-slides in the past, and thus save the expense of putting snow sheds there. Near Wellington, where the recent catastrophe took place, concrete snow sheds, with a total length of about 3,000 feet, will be built. The wooden sheds will be put only in those places which, in the past, have been entirely free from slides, or where the slides have been of minor consequence.

ELECTRICITY.

Our consul at Mersine, Asia Minor, reports that that city, as well as the City of Adana, is to be lighted with electricity. The ancient City of Tarsus is now lighted with 450 street lamps, in addition to which there are about 500 lamps used in private houses. The Tarsus electric system will be extended to Mersine and Adana. The current is generated at a power station on the Cydnus River.

A novel emergency wagon has been put into service by the Union Railway Co., of this city. It is a gasoline electric truck, the primary motor of which consists of a 4-cylinder, 4-cycle, water-cooled engine of 40 horse-power. The truck is adapted for drawing in under-ground cables and is furnished with the usual elevating platform for providing access to overhead trolleys. In addition to this it can be used for removing wrecks, for towing, for carrying construction materials and for general all-around work.

It has been proposed to use selenium for absolute measurements of light. However, the action of the selenium cell is very uncertain and it is impracticable to use it in this way, but the same cell may be used for measuring fluctuations of light from a single source. Writing in the Illuminating Engineer of London, R. Presser describes an apparatus which he has devised, consisting of a selenium cell in combination with a recording drum. Variations of resistance of this cell, due to fluctuations in light which falls upon it, are registered on the drum, thus providing a record of the light.

Electric signs are not used in Great Britain to the extent that they are in this country. Our Consul at Glasgow reports that though that city with its suburbs contains over a million inhabitants, there are not a dozen places provided with electric signs, and he advises American sign manufacturers to introduce such novelties as automatic appearing and disappearing signs, moving figures and the like, which might appeal to merchants. None of the theatres of Glasgow is provided with cab signals and as a consequence the congestion about the theater doors is much greater than necessary.

An interesting example of the use of flaming arc lamps for outdoor illumination was afforded by the lighting of the arena of the recent United States Army Tournament at Chicago. The area of the arena was 400 by 600 feet and it was surrounded by tiers of seats providing accommodations for 40,000 spectators. The field was lighted by eighty 550-kilowatt flaming arc lamps arranged in ten rows of eight lamps each. The lamps were suspended to a height of 35 feet from the ground. The type of lamp used was arranged to distribute most of the light within an angle of 36 degrees from the vertical and the effect proved entirely satisfactory. In the tournament 3,000 soldiers took part in all kinds of maneuvers which could be followed with perfect clearness by the spectators.

Results of the tests of the Edison-Beach storage battery power, on the 28th Street Crosstown line of this city, for the months of March, April, and May, have just been given out. During this time, the car traveled 5,152.5 miles and was on the road 1,132.5 hours. The daily charge of the batteries was 48,840 watt-hours and the energy delivered at the motor brushes was 30,280, or 62 per cent. This car has traveled, so far, over ten thousands miles without requiring any repairs, except for the renewal of one motor brush. The battery has called for no attention, except for the addition of 70 gallons of water. In this connection it is interesting to note that the proposed line between Pittsburg and Cincinnati will probably use Edison-Beach cars. The franchise of this line expired the 5th of June, but was extended until the 1st of September, and we are informed that work is about to be started and that the line will be completed within three years. By using storage battery cars it is expected that a saving of 40 per cent on the construction will be effected.

A recent number of the Electrical World contains an interesting article on a gasoline electric truck used for hauling ore from a lead and zinc mine in Mexico to Marathon, on the Southern Pacific, 85 miles away. For a number of years the ore was blocked out, but there appeared no means of transporting it to the railroad station, as the territory was absolutely impassible for anything but burros. A good road was built and at first a gasoline truck was tried, but this proved a failure. Then it was proposed to use an electric truck, but this idea was also abandoned finally in favor of the combined gasoline electrical system of propulsion. The truck has a 4-cylinder gasoline engine direct-connected to a 15 kilowatt compound-wound generator. The truck on which the engine is mounted is supported on four wheels, all of which may be steered so as to permit of rounding sharp turns on mountain roads. The ore is carried in a separate two-wheeled truck of 15 tons capacity, which is supported at its forward end on the power truck.

AERONAUTICS.

Orders, it is said, have been placed in Paris for Odier Vendome monoplanes for two well-known American women. The machines will be even smaller than the Santos-Dumont Demoiselle.

The Ville de Lucerne, a dirigible airship, has been making test flights over the Lake of Lucerne. The craft is capable of carrying 14 passengers and is said to be used for regular passenger service.

Mr. Clifford B. Harmon has fitted two vertical bomb-dropping tubes to his Farman biplane. He expects to experiment at dropping confetti bombs upon a battleship marked out on the field at Mineola.

At the first try-out of his monoplane last week at Mineola, Dr. Walden had an accident and broke his collarbone. He ran the machine over the field at a fast clip, but allowed the tail to rise too high off the ground, with the result that the aeroplane turned a forward somersault. This accident makes it seem as if a mirror arranged so as to allow the aviator always to observe the position of the tail would be an excellent accessory for monoplanes.

On August 3rd, Nicholas Kinet, the Belgian aviator, fell to his death at Brussels in his Farman biplane. It is thought that a guy wire broke and became entangled in the propeller. The machine plunged to the ground from a height of 600 feet. Only a few weeks ago Kinet's brother Daniel was killed in a similar manner with a biplane of the same make. Although it might be of little use with a biplane owing to the position of the aviator, we believe a parachute could be carried with good effect on a monoplane. Then, should the machine plunge or the wings break off as in the case of Wachter, the pilot could release the parachute and descend to earth in safety.

Melvin Vanniman has arrived from France with the Wellman dirigible "America," which he intends to set up at Atlantic City at once. After a few trial flights have been made Walter Wellman and Vanniman expect to attempt a trans-Atlantic trip. A flight from America to Europe in a heavier-than-air machine also, is a possibility in the not far distant future. The distance across, near the Arctic Circle, is only about 500 miles. Olieslagers covered half this distance in his Blériot monoplane at Rheims, and Morane carried 412 lbs. weight of passengers (2) in his Blériot at Bournemouth. If all this weight were put into fuel, there would be sufficient to make a 500-mile continuous flight.

According to the latest plans of the Aero Club of America the international aviation meet from October 15th to 23rd will be held at Belmont Park, L. I., instead of on the Hempstead Plains, near Mineola and Garden City. Inability to finance the meet and build the requisite grand stands and sheds is given as the cause of this change. As the 62.1-mile international race for the Bennett Trophy must be held over a three-mile course, it is the present intention to run this particular race above the plains and throw it open to the public. If this is done, however, according to the rules, the club will have to provide extra sheds there for all the foreign contestants. It is probable that Mr. J. Armstrong Drexel, of Philadelphia, will be one of the American representatives with his Blériot monoplane. If an elimination race is necessary to select the American team, this will be only a few days before the race itself, which occurs on October 22nd.

A new German invention of value for non-dirigible balloons is reported by Consul Thomas H. Norton, of Chemnitz: Illuminating gas is forced through long tubes, maintained at a very high temperature. Most of the carbon in the hydrocarbons is thus separated out and the percentage of hydrogen is largely increased, so that this gas constitutes 80 per cent of the modified coal gas. At the same time it is deprived almost entirely of its characteristic odor, and freed from the presence of benzine, which exerts an undesirable solvent action upon the materials employed to render balloons impermeable. The most important change is that in buoyancy, as the specific gravity sinks from 0.44 to 0.225, or less than one-quarter the weight of air. This means that 1 cubic meter of the new gas can support a weight of 1 kilo (2.2 pounds). In coal gas, 1 cubic meter supports 0.7 kilo. A balloon with a capacity of 7,000 cubic feet, when inflated with the new gas, has a lifting power equal to that of a balloon of 10,000 cubic feet charged with ordinary coal gas.

The aviation meet at Pittsburg, Pa., last week was not a great success because of heavy wind. Curtiss, Mars, and Capt. Baldwin made flights in their biplanes. Mars is reported to have risen from the ground after a run of but 35 feet against a heavy wind. His previous record was 54¼ feet. His flight last Thursday across the field in the high wind was accomplished with great difficulty. On Friday, about 7 P. M., Curtiss made but one circuit of the field in the strong wind that prevailed, while Mars damaged his biplane in making a sudden dive. Capt. Baldwin also circled the course once.

LIQUEFIED ILLUMINATING GAS

BY WALTER LANGFORD

In 1901, Herman Blau, a successful chemist of Augsburg, Germany, invented a process of liquefying gas to furnish light, heat, fuel for cooking and power to buildings and residences at present not supplied with city gas. The gas, known as Blaugas, has only recently been placed on the American market. It is sold and delivered in steel bottles, similar in form to those used for transportation of oxygen and carbonic gas. These bottles are imported from Germany and are of the finest obtainable quality of tough steel.

The simplicity and economy of the process are remarkable. The mechanical equipment consists of the usual benches of retorts, scrubbers, purifiers and coolers and the gas engine and compresser. The only necessary raw product needed in the manufacture is a pipe line furnishing gas oil and ordinary labor. This oil furnishes the fuel, the power and the resultant compressed gas. No further fuel or power is required and there is no waste product or residuum to sell or dispose of.

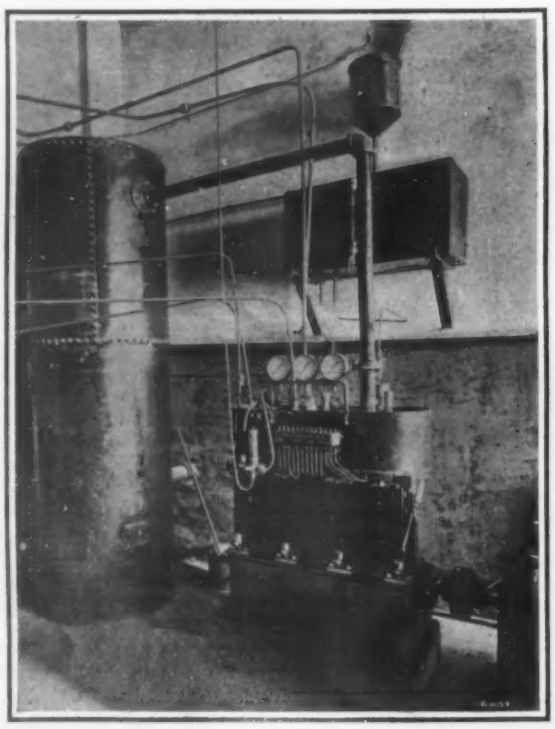
The process of manufacturing the gas is similar to that employed in the ordinary production of gas from oil. The raw product used is what is known commercially as "gas oil," the by-product of petroleum after kerosene, gasoline, naphtha and the lighter spirits have been distilled off. This oil is distilled in retorts, but the "cracking up" of the oil occurs at a very much lower temperature than in the usual oil gas process. After this treatment, a residuum of light tar remains, which by-product furnishes all the heat or fuel required in the retorts. The gas is then scrubbed, purified and passed into a gas holder, from which it is drawn into a compressor and passed through coolers. This stage of the process is based upon the well-known chemical theory that a liquid will absorb a gas; that the nearer the liquid and the gas are in chemical affinity the more gas will be absorbed; that absorption increases with the cooling of the liquid, and that the greater the compression, the greater also will be the absorption of gas.

The gases which cannot be liquefied are drawn off and conducted to a gas engine to furnish such power as is needed in the factory, while the gases which can be liquefied and which absorb permanent gases, are drawn off into steel bottles ready for shipment.

As the gas is in compressed form, an expander box is used to transform it into an expanded gas at proper pressure for ordinary service. This is automatically performed and requires no attention on the part of the consumer. The expander box is substantially constructed of iron and therefore weather proof. It contains two bottles, a steel expansion tank, pressure valve and regulator. The liquefied gas passes through a siphon tube from the bottle in service to a pressure reducing valve connected with a gage, so that at all times the amount in the bottle can be determined. When the bottle is exhausted the second, or reserve bottle (already connected) is turned on. Three bottles go with each expander box, so that there is always a supply in reserve. After passing through the pressure reducing valve the liquid gas has become a compressed gaseous gas in the steel expansion tank, dry and uniform in quality, and thence it passes through a pressure regulator into the service pipes of the building or house at any pressure necessary to produce the desired candle powers. The gas has not the asphyxiating danger of ordinary city gas. Its explosion range is low. It will not freeze or condense in pipes, since it is perfectly dry when expanded. It is a very heavy, rich gas, with a great calorific efficiency value. One cubic foot gives over 1,800 British thermal units, or three times that of one cubic foot of the best quality coal gas. This great heat efficiency produces, using an ordinary, small Welsbach mantle, a minimum of 80 candle power per cubic foot, or more than four and a half times the candle power per cubic foot of ordinary city gas. The burners used are usually of the inverted type, according to the latest lighting practice.

Photograph of a room illuminated with Blaugas and taken by the light of Blaugas.

Lastly, and not of least importance, Blaugas has a distinct industrial use in the arts and sciences and in manufacturing. Small or large outfits in conjunction with oxygen can be used in machine shops, and by blacksmiths in cutting metals, welding, brazing, soldering, melting, fusing, annealing, etc. The constant and uniform pressure of the gas makes it useful to the cloth manufacturer and finisher for singeing. It has been used on railroad trains, lighthouses, yachts and vessels, automobiles and generally for any purpose to which any gas or illuminant can be applied. The gas is sold by the pound, therefore no meters are used.



The compressor for filling small tanks with gas.

Liquefied gas outfit ready for operation.

The Recent Study of the Moon.

The complexity and difficulty of the lunar theory have attracted many eminent mathematicians, but at present it appears to be agreed to leave to Prof. E. W. Brown alone the completion of a set of lunar tables to replace those of Hansen. It is expected that this great work will be finished in three years. Although all known physical influences are being taken into account, it is certain that the new tables will not entirely remove the discordance between theory and observation.

An important contribution to the study of the libration of the moon has been furnished by Stratton's new reduction of the observations made with the heliometer by Schlueter in 1841-1843. Stratton has discovered the source of the disagreement between the conclusions of Franz and Hayn. The research also demonstrates the necessity of employing still more prolonged series of visual or photographic observations in order to determine with certainty and precision all of the numerical constants required to the theory.

After seven years' labor, Goodacre has completed a general map of the moon on nearly the same scale as Schmidt's map, but more exact, because it is based on Saunders' micrometric determinations of 1,433 points of the lunar surface.

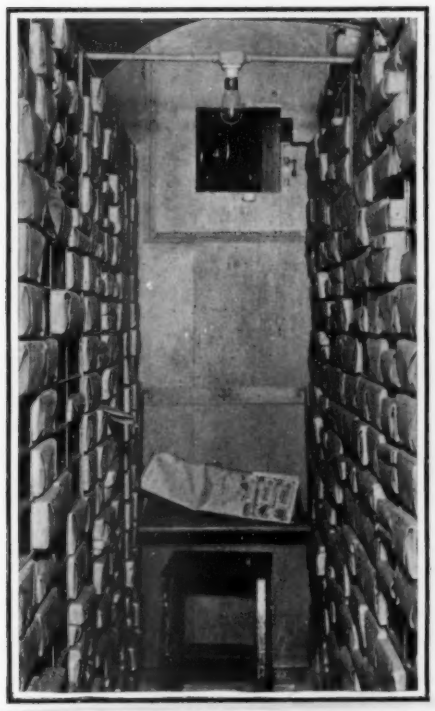
For the study of changes in tint and other physical phenomena, however, the best lunar maps must be supplemented by photographs like those of the great lunar atlas of the Paris Observatory, the eleventh part of which was published during the past year, together with a discussion of the causes of the contrasts in the color of neighboring regions of our satellite, and of the conditions of survival of lunar volcanic deposits.

The famous meteorological observatory at the summit of the Sonnblick, in the Austrian Alps, is in need of funds, and there is danger that it may share the fate of the regretted observatories on Ben Nevis unless its friends come to its assistance. A society known as the Sonnblick-Verein was organized some years ago to aid the Austrian Meteorological Society in supporting this institution, and is now endeavoring to increase its membership. The cost of membership is only 4 kronen (about 80 cents) a year, or 200 kronen ($40) for a life membership, and members receive free the yearbook of this society, containing a good many important memoirs on mountain meteorology. Communications on this subject should be addressed to the headquarters of the Sonnblick-Verein, Hohe Warte Nr. 38, Vienna, Austria.

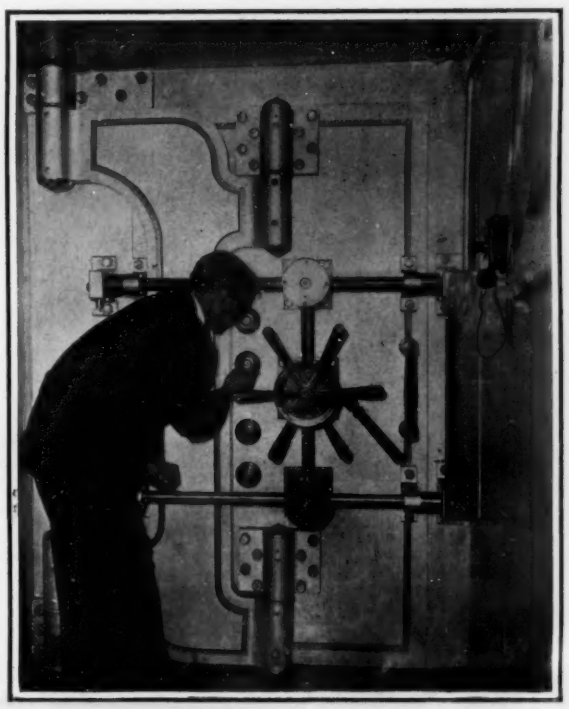
$500,000,000 READY FOR AN EMERGENCY

BY THOMAS D GANNAWAY

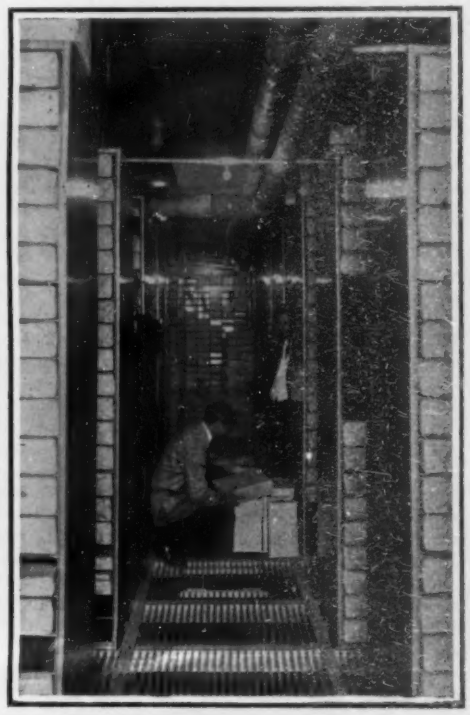
The Aldrich-Vreeland Currency bill passed on May 30th, 1908. It provided that the Comptroller of the Currency—who has government supervision of all the national banks—should cause to be printed and kept on hand, at all times, 50 per cent of the combined capital stock of all the national banks in existence. There were at that time 7,000 national banks in the United States, including the territories of Alaska, Hawaii, Porto Rico, and, of course, Arizona and New Mexico. These banks had a combined capital stock of more than $950,000,000, which made it necessary to increase the amount of national bank notes kept by the Comptroller of the Currency by about $500,000,000 over and above the $200,000,000, which had to be kept prior to the enactment of this bill for the current use of the national banks.



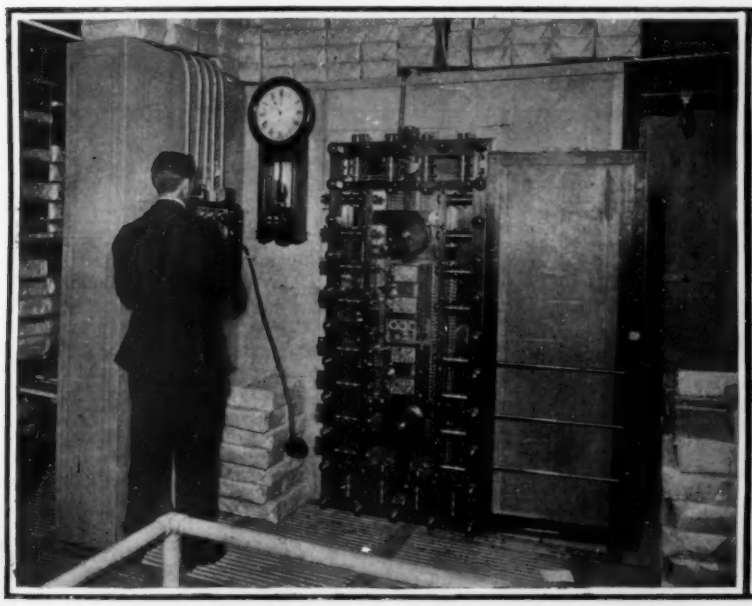
Showing a cross-aisle port hole where air is forced out and some money partly out of wrapper on shelf.



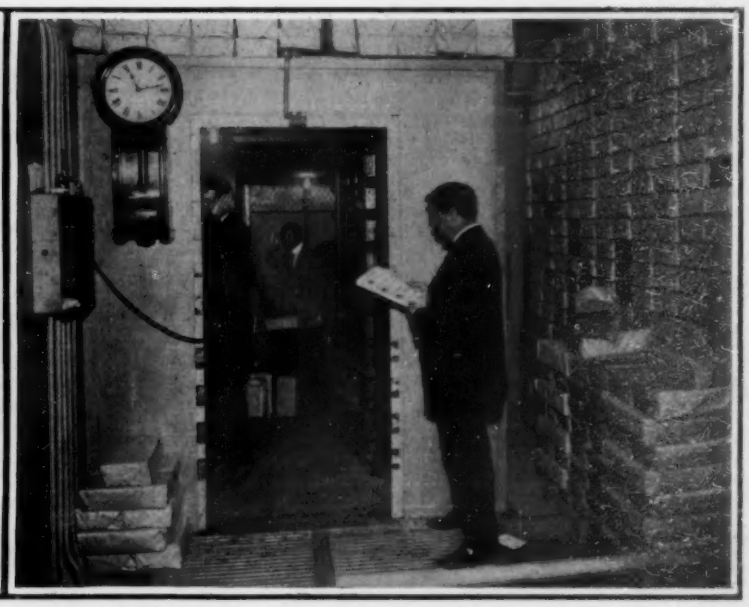
Unlocking the main door of the store-room in which $500,000,000 are kept ready for an emergency when another panic comes.



Putting each money package in proper place; also showing main aisle.



Interior view of glass door opened back, showing the main door.



Interior view looking out into elevator. Loading money onto elevator to take to current vault.

$500,000,000 READY FOR AN EMERGENCY.

The preparation and storing of this vast amount of money meant a tremendous undertaking. The bill became effective immediately upon its passage. It provided that in case of emergency other securities than United States bonds may be accepted by the government to secure additional circulation. This necessitated changing the legend on about 11,000 thousand plates (many of the banks having two and three plates each). It was made to read as follows: "This note is secured by United States government bonds or other securities," instead of, "This note is secured by United States government bonds deposited with the Treasurer of the United States." Immediately after the passage of the bill, the Director of the Bureau of Engraving and Printing put his force of engravers to work changing these plates, and at the same time the Chief of the Issue Division of the Office of the Comptroller of the Currency began ordering currency of the new design to the amount of 50 per cent of the capital stock of the banks as fast as their plates were changed. This procedure was kept up until all the plates had been changed and the proper amount of new currency ordered for all the banks. Prior to this act, currency to the amount of only about 20 per cent of the combined capital stock of all the national banks had been kept on hand. This amount is still kept, in addition to the 50 per cent reserve, and is designated as current, or working, stock. It is used to replace the national bank notes as they become old and unfit for use; also to supply the demand for additional United States bond secured circulation.

With one exception, national bank currency is printed in sheets containing four bills to the sheet. That exception is a sheet of two notes (one $100 and one $50) making $150 to the sheet. The other three plates printing four notes each, are one of four $5 notes, making $20 to the sheet; one of four $10 notes, making $40 to the sheet, and one of three $10 and one $20 notes, making $50 to the sheet. This money is sent to the banks in the original sheets and the bills are cut apart by them. The bank must pay for the plates from which its money is printed. The two-note plates cost $50 and the four-note ones cost $75 each. The maximum size package put up by the Bureau of Engraving and Printing is one thousand sheets. The general average value per thousand sheets is $37,500. This would necessitate vault space to store away over thirteen thousand sheets—weighing eleven pounds to the thousand—so that any package that might be wanted could be easily gotten. At this time almost every available inch of vault space in the Comptroller's office was already taken up with the $200,000,000 current stock. Now Congress had authorized the printing of the money and it had begun to come in and there was no room for it. So the Secretary of the Treasury at about a block away rented the basement of a bank building —the walls and floor of which, were built of brick and concrete, and had a number of wooden cupboards made and set in it, and began filling them with money. It was protected by iron gates leading to the room and by two armed watchmen in daytime and four at night. In the meantime a large force of men were working

day and night on a new vault in the Treasury Building. Although this edifice is almost two blocks long, one wide and six stories high, it is entirely inadequate to furnish office room for the Treasury Department, and much room in various buildings in different parts of the city has to be rented. It was decided to build the new vault in the sub-basement of the Treasury Building and make it two stories high.

Only two bids for the construction of this vault were received, and these were opened by a Treasury official on October 6th, 1908. They provided that the work would be completed within a certain specified time. It was then decided by the Treasury officials that it must be finished sooner. So they asked for another bid from each contestant for completing within a shorter period of time than was originally asked for. These bids were opened October 12th, 1908. The York Safe and Lock Company bid $34,377 and the Mosler Safe Company bid $34,551, thereupon the contract was awarded to the York Safe and Lock Company of Erie, Pa., on October 26th, 1908. Work was begun about November 25th and pushed vigorously day and night, until the job was completed.

The vault is fifty-three feet, nine inches long, nineteen feet, eight inches wide, and sixteen feet, six inches high. Thirty-four large sheet steel double cases are placed in two rows on both floors with ends against the two side walls, leaving an aisle on each floor about three and one-half feet wide, the full length of the vault, and short ones running crosswise between the cases. There are two single cases extending all the way across the ends of the vault. These cases are divided into 15,267 pigeonholes just large enough to hold 1,000 sheets of money. The second floor, onto which the main door opens, is made of open grate iron. This aids very materially in properly lighting and ventilating the vault. At the western end near the top is an opening about fifteen inches square. Running from this opening the full length of the vault down the center of the roof is a galvanized iron shaft about 8 x 20 inches; then running from this to various parts of both floors are small shafts open at the ends. Just outside of this fifteen-inch opening (or port hole) is a large fan run by a three horse-power electric motor, which forces air into the large shaft, and it is thereby distributed through the small ones to all parts of the vault. At the eastern end is another fifteen-inch port hole which serves as an outlet for the air as it is forced through by the fan. With this ventilating system the air in the vault can be completely changed in about two minutes time. The two port holes are closed at night with heavy steel doors, which are swung into place and then tightened up by means of a hand wheel and cogs, each one as it is closed forming a part of the electric protective system. The vault is lighted by fifty tungsten electric lights of ninety candle power each. The lights and ventilation are ideal and would be very hard to improve upon. It is said to be the best lighted and ventilated vault in the United States. There is nothing to equal it in Washington, D. C.

Seventeen miles of wire were used in constructing the electric protective system, which, when completed, cost $9,000. It is operated by a private company outside of the Treasury Building. They test the system every fifteen minutes day and night, by means of telegraph sounders which are placed inside of the vault. The operator in the company's office can tell by operating the keys if the sounders in the vault are working, and upon seeing that they are, his mind is relieved by knowing that everything is intact. As I have already stated, closing the two ventilating port holes forms a part of the electric connections. On the inner side of the large door is a large glass door which has been molded over a layer of small wires placed about three-fourths of an inch apart. This door, when closed, forms another electric connection and also makes it impossible to blow a hole through it without disturbing the burglar alarm. Having closed the big door, then the vestibule door, which is outside of the big door, is closed, thereby forming the fourth and last electric connection and completing the circuit. If these openings are properly closed the report from the sounders inside of the vault is immediately transmitted by wires and delivered to us through a telephone receiver which is placed outside. Then we know that all the openings are properly closed. The burglar alarm service make an extra test as soon as their indicator shows that the vault has been closed. Should we fail to get their report, they, upon being notified of the fact, take extra precautions to guard the vault through the night by sending a man to inspect it every hour. The government also has watchmen guarding it all the time. There is an agreement between the Chief of the Issue Division and the burglar alarm service that the reserve vault will not be opened prior to 8:30 A. M., and will be closed by 5 P. M. Several times recently it has been impossible to close by 5 P. M., and in about five minutes time thereafter a man arrived from their office for a written statement as to why the vault was not closed. This is done every time the agreement as to opening and closing is not strictly complied with.

The Office of the Comptroller of the Currency is located on the second floor of the Treasury Building, and the vault is reached by means of a private elevator running down from the Issue Division to the vault entrance. A private telephone line connects it with this division. The vault was completed and turned over to the Comptroller's office on May 18th, 1909. By this time the millions of dollars which had been pouring into the basement of the bank building every day had reached the vast amount of $318,000,000. Now, the one great problem confronting the Comptroller's office was the safely moving and storing into the new vault of this vast amount of wealth. It had to be moved in regular order so that any package that might be wanted could be easily found. Box trucks were made of a force of clerks and laborers at the bank building and a record was made of every package as it went especially for this job. A man was placed in charge into the truck. Four of these trucks were filled, locked and rolled into a wagon, somewhat resembling a box car (only much smaller), and then it was locked and guarded on its way to the Treasury Building. There the trucks were received and unlocked in the vault by the writer, and the packages checked and put into their proper places. Each load contained approximately $10,000,000.

The moving was begun with a force of thirteen men on May 18th, 1909, and continued from day to day until the work was completed May 28th. Now the money was all moved and each one seemed to sigh with much relief to know that the task was completed without the loss of a dollar. This $318,000,000 balance continued to grow until it reached the maximum amount of $506,074,240 on February 1st, 1910. This is said to be the largest amount of money contained in any one vault in the United States.

This vast number of dollars is almost inconceivable. If it were spent at the rate of $500 per day, counting 365 days to the year, it would take twenty-seven hundred and seventy-three years to get rid of it.

The total balance in the Comptroller's office is at present approximately $700,000,000. Why should we have another panic? This enormous amount of money is at the disposal of the national banks as rapidly as they deposit the necessary securities with the Treasurer of the United States. The Aldrich-Vreeland bill provides that the regular national bank currency and the emergency currency shall be of the same design, the only difference being the manner in which it is secured. Before a bank can get any emergency currency secured by commercial paper it must be a member of a currency association formed by at least ten banks with a combined capital of not less than $5,000,000. After this has been done a bank desiring some emergency currency would present its securities, which may be State, county or municipal bonds or commercial paper (in fact almost any kind of good approved security), to the association, then after its approval they would be sent to Washington for governmental approval. If they were satisfactory the currency would be immediately sent to the bank. Then there is a graduated tax placed upon this money until it is retired by the bank issuing it. The tax is 5 per cent per annum and is increased 1 per cent per month until it reaches 10 per cent per annum. So far there has been only one of these associations formed, and that one is in Washington, D. C., but not a dollar of emergency currency has been asked for.

The government becomes liable for the redemption of all national bank notes as soon as they leave the Comptroller's Office, even though they be stolen while in transit. There are spaces on each note for the signatures of the president and cashier of the bank to which it is issued, but the act of July 28th, 1892, makes the government bound to redeem them whether they are signed or not. Hence one can readily see the great necessity of having the securities before the money is started to the banks. The average daily shipments for the year ending December, 1909, was 680½ packages, amounting to $1,346,108, which makes a grand total of 207,079 packages valued at $406,511,430 for the year.

A paper by Dr. Thornton and Mr. Bowden on "The Ignition of Coal Dust by Electric Flashes" was recently read at Newcastle, Eng. Experiments have shown that dry coal dust in bulk is a non-conductor of electricity, but when made into a paste with water it is liable to cause a short-circuiting flash if placed between electrodes. If a flash is produced—as by opening a switch—in a cloud of dust an explosion is produced. The character of the dust cloud and the strength and voltage of the current broken, affects the readiness with which the dust is ignited, and at medium voltages direct current appears to be more dangerous than alternating. In view of the conclusive experiments on coal dust explosions produced by the discharge of a cannon, as carried out at Altofts, the results obtained by Messrs. Thornton and Bowden were to be expected.

Correspondence.

"MECHANIPULATE," ET AL.

To the Editor of the Scientific American:

Using the word of the unequaled "Teddy," bully for mechanipulate! Now, give us another word to replace that misnomer, manufacture, which we use to describe the process of making by machinery the articles which long ago were made by *Manus*. We also need a word to describe typewritten copy in opposition to that which is really manuscript.

Mr. H. A. W. Moore has done the language and the people who speak and write it a great good. Will he—or you—not add to the good by making other words as suggested above? S. Cummings-Huet.

New York City.

SAFETY DEVICE FOR AEROPLANES.

To the Editor of the Scientific American:

The undersigned begs leave to suggest the following as a possible improvement in safety devices for machines used in navigation of the air, but more particularly for heavier-than-air machines:

A combination in an aeroplane or airship of a galvanometer, an electric battery, or other device for generating and maintaining a constant electric current and devices adapted to connecting in electrical circuit with the galvanometer and battery or generating device the metallic wires, parts of members of the aeroplane or airship and their connections.

For the purpose of indicating, by means of the galvanometer, injuries or abrasions of said metallic wires, parts or members and their connections, such as would reduce their cross section or materially reduce their strength and safety factor.

The purpose of drawing this claim and publishing it is to prevent it from subsequently being patented, and to give all interested free use of the suggestion, if perchance it should be found to contain any elements of value. Albert W. Buel.

"GYRO" TERMINOLOGY.

To the Editor of the Scientific American:

Now that the energy of gyration is being utilized more and more to produce balancing, and machines for this are becoming more prominent in engineering design, it might be well to agree upon words describing them. As far as I know, the dictionaries have no such words; nor will they, until such devices have become important enough to be given names by their designers or users.

It is ridiculous to call a machine that gives stability to an ocean-going ship a gyroscope. This word applies only to the laboratory instrument which illustrates or gives a view (= *κοσ γπ*) of the principle involved. One need not be much of a lexicographer to produce the right words. Those that I am giving seem to be the only ones logically available; their roots are already in use for like purposes in other branches of engineering:

Gyrostat, *n.* A machine for producing stability by its energy of rotation.

Gyrostasy, *n.* The condition or state of such stability.

Gyrostatic, *a.* Of or pertaining to a gyrostat; or having its properties and effects (static).

Gyrodynamic, *a.* Having such properties and effects (dynamic).

Gyrostatics, *n.* The study and the principles of the gyrostat and

Gyrodynamics, *n.* Of gyrostasy, static and dynamic.

Any criticism that may result in better nomenclature will be welcome. A. W. Bedell.

Chappaqua, N. Y.

THE RENAMING OF OUR WARSHIPS.

To the Editor of the Scientific American:

In connection with your article on renaming the navy, in the Scientific American of July 9th, permit me to say that there are many examples of renaming ships that are still retained in the naval service. The four single-turret monitors ordered built in 1898, and named "Arkansas," "Florida," "Nevada," and "Wyoming," have been renamed in the last few years to permit their names being used for battleships. The "Minnesota," "New Hampshire," "Vermont," "Michigan," and "St. Louis" were all named at a time when ships of those names were then on the navy list, and but two of the old ships have been broken up, the other three being still in service under other names. The cruiser "Charleston" was named after the elder cruiser of that name, lost in the Philippine Islands. And it is a little-known fact that, outside of the destroyers and submarines, about three-fourths of the fighting ships of our navy carry names that have been carried by ships of the navy in the past. In the opinion of the writer, it would be the part of wisdom to change the names of the armored cruisers of the "Colorado" class, and give their six names to battleships; and thereafter, whenever a battleship or armored cruiser is no longer up to the standard for ships of her class, replace her by a modern ship and

change her name. This action should be taken in the case of the "New York" and "Texas" by all means. Much less objection would be made to this if every ship were provided with a tablet showing the history of the name. CHARLES F. CHURCH.

Provincetown, Mass.

THE WHITE MAN VERSUS THE SAVAGE.

To the Editor of the SCIENTIFIC AMERICAN:

In your number of July 2nd you have an article by Prof. R. S. Woodward on the above subject.

My personal experience is that, in the matter of sight in hunting it is experience, not exceptional good sight, which enables some men to see game sooner than others.

To give an instance, a party of us saw, at some 1,000 yards distance, a herd of deer. All the party could see them. I said they were all bucks and nobody would believe my being able to know this with the naked eye, but taking a telescope it was seen that I was right.

Now I did not see the bucks but, the sun shining brightly at the time, I noticed a flash of light occasionally over the herd. I knew this must be the sun reflected from the horns of the bucks as they turned their heads, and as at that time of year the bucks keep together, I knew it was a herd of all bucks.

In the same way I can find deer much quicker than most people. That is not because I can see farther, but because I know where to look for them. Most people waste time looking all over the landscape; I look for deer only under the shelter of ridges, etc.

What I want to try to prove is that the savage, knowing much more about game, is able by induction to supplement what he sees, and thereby can know things which to people ignorant of the habits of game are attributed to some extraordinary development of his senses.

Color also plays a great part in this faculty of seeing far. I often find a deer by its color not being in harmony with the rest of the landscape, when it is too far off to see its shape.

I found the first wild chamois I had even seen, before the professional Alpine guide with me, by noticing its color. WALTER WINANS.

Surrenden Park, Pluckley, Kent, England, July 18th, 1910.

New Mare Island Drydock.

Very recently the new and immense drydock that was constructed by the Government at the Mare Island Navy Yard, Cal., has been formally accepted, and is now in commission.

In completing the work it was necessary to use altogether 15,000 piles, 90,000 cubic yards of concrete, 15,000 cubic yards of stone and 3,000,000 feet of timber. The total length of the dock is 791 feet. Its width at the bottom is 76 feet, and at the top 120 feet. A vessel drawing 34 feet may easily enter the dock. With the exception of the dock at Hunter's Point, San Francisco, Cal. (which is 850 feet long), the new Mare Island basin is the largest on the Pacific coast, and among the large drydocks of the world.

This new drydock has been seven years in its construction, and from this fact some adequate idea may be formed of the great engineering difficulties that beset the work from the very commencement. The building of the bottom was the most difficult, the slowest, and the most expensive part of constructing this great basin. The walls consist mainly of big blocks of California granite, supplemented by concrete.

Excavation was first begun about seven years ago by the Atlantic, Gulf and Pacific Construction Company. Later, however, this company was compelled to abandon the contract.

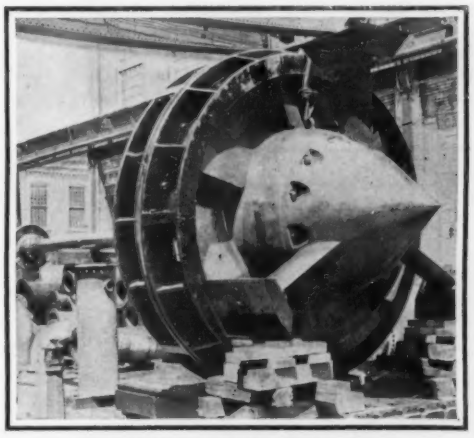
About four years ago the Schofield Construction Company undertook the contract, and it has finally brought the work to a successful conclusion. The total cost to the Government of the dock has been $1,300,000.

In building the floor of the huge dock it was necessary to drive about 14,000 piles; then, on top of this a massive structural steel frame was laid. On the latter was built up 9½ feet of strongly re-enforced concrete. The main engineering difficulty was in building a firm foundation for the floor, which entailed great labor and immense quantities of material.

At the forthcoming annual meeting of the Comité de Forges de France an interesting ceremony will be the presentation of a commemorative medal to M. Pierre Martin, one of the inventors of the process of manufacturing Siemens-Martin steel. It may be mentioned that in France the name of Siemens is never associated with the invention, and that the whole credit is given to M. Martin, who, nevertheless, fully deserves the honor he is receiving in his own country. Moreover, all the foreign metallurgical societies have decided to be represented at the forthcoming ceremony, at which the Minister of Public Works will also be present. M. Martin, who is eighty-five years of age, is one of those rare inventors who have lived long enough to see an industry entirely revolutionized by their methods, and the world benefit from their inventions.

THE LARGEST PUMPING STATION IN THE WORLD.

The drainage canal and incident works of the sanitary district of Chicago have attracted the attention of engineers for several years. Of chief importance has been the method thus employed of securing a pure water supply for a city of this size. Previous to the beginning of this work the sewage of the entire city was discharged into the harbor directly, or through the Chicago and Calumet Rivers. This condition of sewage pollution led to severe epidemics of typhoid fever and Chicago had an unenviable reputation for this disease. Long and serious study of conditions



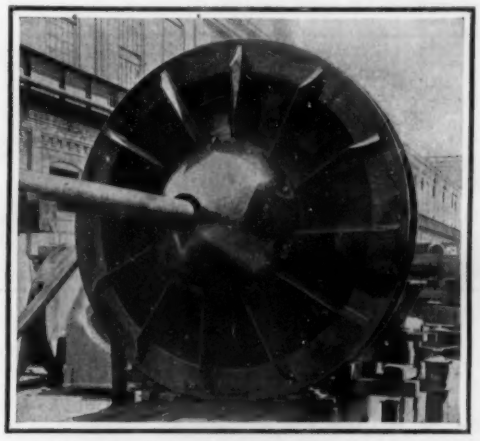
SUCTION SIDE OF THE SCREW PUMP.

by both engineers and sanitarians, led to the determination of the system finally adopted for removing the trouble.

This consisted in the construction of a canal, about 28 miles long, connecting the Chicago and Desplaines Rivers, striking the latter near Lockport. By this means the direction of the flow of the Chicago River was reversed and the waters of Lake Michigan were used to dilute the sewage which later finds its way to the Mississippi River.

Upon the completion of the canal proper further safeguards were carried forward; first the building of an intercepting sewer along the lake shore on the south side of the city, extending as far south as Eighty-seventh Street and covering all that section included up to the Chicago River. At Thirty-ninth Street a pumping station was built, which not only handled the sewage collected by the intercepting sewer, but also took large quantities of water from Lake Michigan and discharged it with the sewage into the south branch of the river, thus tending to maintain a current which would keep it free from any dangerous or disagreeable condition.

This station contains four Allis-Chalmers centrifugal pumps for handling sewage and two screw pumps for taking the water from the lake. It has a total capacity of two billion one hundred million gallons (2,100,000,000) per twenty-four hours, which is the largest pumping capacity of any single plant in the world. After this was completed work was started on what is



DISCHARGE SIDE, CAPACITY 250 CUBIC FEET PER SECOND.

known as the Lawrence Avenue Station, which handles the sewage from the intercepting sewer along the north shore of the city and also takes water from Lake Michigan and discharges it into the north branch of the Chicago River.

Besides these projects already completed, the district now has under construction what is known as the north shore channel on which will be located the Wilmette Pumping Station. There is also in contemplation a plan for the reversal of flow in the Calumet River at the southern end of the city, and when this is completed, together with certain sewage pumping stations which the city itself maintains, the entire shore front of Chicago and its immediate vicinity will be well protected.

The construction of the north shore channel is progressing quite rapidly now and probably within the course of the present year will be completed and in operation. This channel takes water from Lake Michigan near Wilmette and discharges it into the north branch of the Chicago River. From the Lake to Sheridan Road, a distance of about 400 feet, the water will flow by gravity. Here a viaduct carries this road across the canal channel, and built as a part of the viaduct and beneath it is the pumping station and a lock. This lock will be used for allowing barges and tugs, used in keeping the channel free, to go into the lake for discharging their loads. The bridge proper will consist of a steel framework faced with Bedford stone, thus giving the appearance of a stone bridge. It will have a paved roadway 46 feet wide and two sidewalks each 8 feet wide, with ornamental stone railings.

Beneath the center span of the bridge will be located the pumping station. This will consist of a motor room and transformer room each 29 feet by 54 feet inside dimensions. Four horizontal screw pumps each having a capacity of fifteen thousand cubic feet per minute against a head of 3 inches when running 75 revolutions per minute will be installed, and a view of one of these, taken at the shops of the manufacturers, Allis-Chalmers Company, is shown herewith. Each of these pumps will be driven by a 150 horse-power, 3 phase, 60 cycle, 2,300-volt induction motor. The pump runners will be located on the easterly side of the building with the shafts extended horizontally into the motor room. These pumps are similar in construction to others of the same character installed by Allis-Chalmers Company in the Thirty-ninth Street and Lawrence Avenue Stations.

Official Meteorological Summary, New York, N. Y., July, 1910.

Atmospheric pressure: Highest, 30.18; lowest, 29.66; mean, 29.90. Temperature: Highest, 94; date, 24th; lowest, 63; date, 6th; mean of warmest day, 84.5; date, 25; coolest day, 70; date, 18; mean of maximum for the month, 85.7; mean of minimum, 70; absolute mean, 77.8; normal, 73.5; average daily excess compared with the mean of 40 years, 4.3. Warmest mean temperature of July, 78.1, in 1901; coldest mean, 70, in 1884. Absolute maximum and minimum of July for 40 years, 99 and 50. Average daily excess since January 1st, 3.0. Precipitation: 0.23; greatest in 24 hours, 0.12; dates, 16th and 17th; average for July for 40 years, 4.54. Accumulated deficiency since January 1st, 3.85. Greatest precipitation, 9.63, in 1889; least (previous to July of 1910), 1.18, in 1907. Wind: Prevailing direction, southwest; total movement, 6,490 miles; average hourly velocity, 8.7 miles; maximum velocity, 31 miles an hour. Weather: Clear days, 11; partly cloudy, 14; cloudy, 6; on which, 0.01 or more of precipitation occurred, 3. Relative humidity, mean of 8 A. M. and 8 P. M., 63.2. Thunder storms, 10th. Next to warmest summer month in forty years. Previous excessive July heat months: 76 in 1872, 1876, 1894, 1900, and 77 in 1887, 1908.

The Current Supplement.

An enormous irrigation project is under way in New Mexico involving the damming of the Rio Grande to form a reservoir which will be the largest artificial body of water in the world. This is described in the leading article of SUPPLEMENT No. 1806 and is accompanied by illustrations of the dam site. The nature of the earth's interior and the question of deep mining is the subject of an interesting article by Prof. E. H. L. Schwartz. Amateurs who are interested in making their own experimental apparatus will find directions for constructing an efficient shocking coil of simple design. A series of articles on steam turbines tracing their development during the last twenty-five years is commenced. The third installment of the serial on Light and Electromagnetism will be found in this number, also the last of the series on Recent Progress in Aviation, by Octave Chanute. The latter contains a very valuable table giving the chronology of memorable flights. Amateur astronomers will find interest in the article by W. B. Denning on the work that they can do in the way of astronomical discovery.

The new station of the Atlantic City Electric Company, which is being built in a meadow near New York Avenue, offers considerable difficulty in the selection of a stable and permanent style of foundation. Owing to the extremely marshy character of the soil, it was necessary to plan a piling system, and from the results of tests it is calculated that 1,530 piles will be necessary to support the station. The tops of these piles will be 6 inches below the level of low tide, so that they will be constantly submerged. Upon them will be placed a solid mat or pad of concrete, upon which will rest the building and machinery foundations, some of which will be carried to 10 feet above low tide.

THE PARSEVAL AIRSHIP

BY CARL DIENTSBACH

When the "air balloon" was invented by the Montgolfiers and Charles, the belief was general that the most difficult part of the problem of human flight was then solved, and that it would require but slight additions to the inflated bag to make it a useful means of transportation. Hundreds of schemes and attempts were suggested to supply the "slight additions." How astonished one of these early naïf "improvers" would be if he could see his dream come true!

Perhaps the most practical airship of our day is the Parseval, which in truth may be called a gas bag with slight additions. The Parseval airship owes its great advantages precisely to the fact that its inventor did not aim at creating something essentially different from a balloon, that he intended to preserve every single good and practical feature of the time-honored "spherical," and that he strove for his comparatively modest goal with so much ingenuity.

A sight not altogether unfamiliar, would greet the eye of Parseval's eighteenth century admirer. First, he would be pleased to learn that the aircraft of his own day, after remaining exactly the same for over a century, had suddenly seen great technical improvement at the beginning of the twentieth century. The gas-retaining qualities, the strength and toughness, the lightness of the new double rubberized and biased balloon cloth would be a revelation to him. Without that fabric the new airship would never have come into existence. But what should otherwise appear really novel to him might only seem as if it were like a "touch" added here and there, but the "touch" of a master hand—comparable to the slight application of the brush, by which great painters are known to have turned a pupil's work into an everlasting masterpiece. Thus the fundamental change from the spherical balloon—the elongated gas bag—means in the Parseval an almost true "form of minimum resistance." This fact is due to the very propitious circumstances which favored the work of Major von Parseval.

It happened that the great German "Society for the Study of Motor Aeronautics" was founded at the initiative of the emperor at the exact date that his first experimental airship was tested. This organization counted among its members the most prominent financiers and the ablest scientists and engineers of the fatherland. Major von Parseval's work presently became the point around which its endeavors crystallized.

All its energies were soon concentrated on the improvement of his simple system, which was justly recognized to promise immediate success. After the model of Professor Zahm's aero-dynamical laboratory in Washington, the society built a laboratory for aero-dynamical research at Goettingen, and put Prof. Prandl of the Goettingen University in charge. In a big Zahm wind tunnel the best shape for the hull was developed on tin models, thus verifying the prediction of Prof. Woodward, president of the St. Louis International Aeronautical Conference, 1904, that the result of Prof. Zahm's and Prof. Nipher's work combined (the latter on the distribution of wind pressure on structures), both submitted to that conference, would result in a form of least resistance for the hull of an airship. Professor Prandl investigated the pressure by means of small holes bored along the whole surface of his models and communicating with many interior compartments, which were alternately connected to pressure gages. He was thus enabled to draw accurate curves. The almost spherical front of the shape evolved by Prof. Prandl would seem most familiar to the man of the eighteenth century. The big fish-like steadying fins at its stern, so conspicuous by their simplicity, would be a surprise. These are indeed the principal contribution of the twentieth century to the old balloon. Invented by the late Col. Renard as early as 1884, they remained a secret up to 1902. The reason for the specially efficient use to which they were put by Major von Parseval is the fact that he, in a way, had independently reinvented them. Even the rudder is so deftly hinged to these fins that it hardly shows. Yet it has an unusually efficient shape and position.

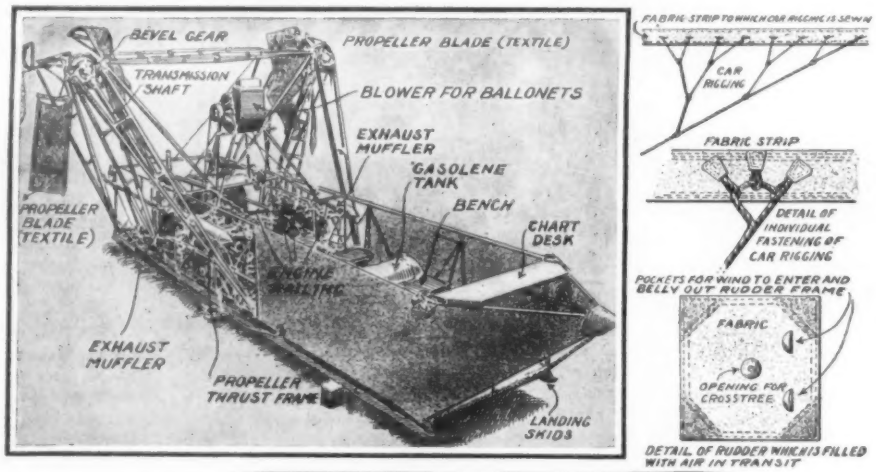
The resemblance of the Parseval to an ordinary spherical is due to the fact that it was evolved from a balloon. Parseval first developed an elongated captive balloon that could be operated in heavy winds. In co-operation with the late Capt. von Siegsfeld, he did this so well that his so-called "Drachen Ballon" is to-day introduced into the military service of most powers. To his airship it is almost as closely related as a glider is to an aeroplane, or a towing barge to a steamer. It offered two formidable problems, steadying it in the wind, and properly suspending the car. To arrive at the nucleus of the Parseval airship nothing more was needed than to modify the "Drachen Ballon." The rounded, sausage-shaped steadying bag of the "Drachen Ballon," whose excessive drag prohibited its use as an airship, was first turned into three rectangular hollow "mattresses" stiffened by internal pressure and part of the balloon. The "Drachen Ballon's" ingenious suspension, flexible to prevent excessive rocking in the gusts, was easily turned into the famous Parseval airship suspension, which allows a "car on wheels" to roll ahead or back on steel ropes, with the air pressure against the gas bag.

To these ingenious devices the Parseval airship owes its existence. Without them it would not be feasible to suspend the car low enough to distribute its weight sufficiently over the whole length of the bag to make it possible to dispense with any sort of a stiffening frame. The ship would pitch so violently that it could not be propelled. Still this very feature is a weak point of the "non-rigid" system. Its inventor personally remarked to the writer, when complimented on the truly beautiful appearance of the "rigging": "Its air resistance is something to be reckoned with." The great saving of weight it permits is thus partly offset. A Parseval has also most of the faults as well as the virtues of an ordinary balloon, while the purely rigid construction, as represented by Zeppelin, Schuette, and others, aims at turning the aerostat into a true "ship." Their goal is infinitely higher, and therefore fundamentally entitled to a more lenient criticism. The ample carrying power of a non-rigid airship makes indeed a large Parseval (type B) a thing of amazing solidity. For instance, the thinnest rope in the suspension has the thickness of a man's finger. The steel wire cables on which the car rolls have the same thickness. The car, detached, as to size and strength, looks almost exactly like a "freak" gasoline launch.

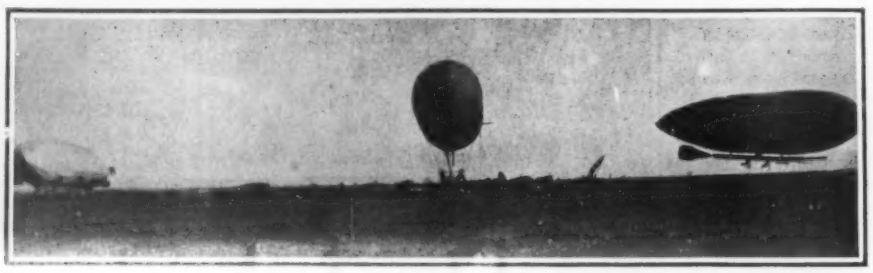
Its board floor, solid as a boat's deck, is 30 feet long and over 6 feet wide. The frame carrying the propellers is made of steel tubes as thick as a man's arm. The center of each propeller is about 12 feet above the floor of the car, and each is also slightly over 10 feet in diameter. The width of each of the four rectangular blades is slightly less than 2 feet. The non-rigid propellers, very inconspicuous when at rest, and directly attached to the car, also increase the resemblance of the Parseval to an ordinary balloon. Each propeller has a girder work hub of steel, skillfully designed to withstand all working stresses with a minimum of material, to which hub four cloth blades are fastened like so many flags. The blades are made of two strong wire ropes with cross pieces of steel, sewn into a double layer of heavy balloon fabric. Major von Parseval explained to the writer that by correctly proportioning the weight of different parts of the flexible blade to a given speed of revolution and a given pitch, any desired form of the blade could be obtained from centrifugal force acting against the pressure of propulsion. It has indeed been claimed that these blades are more efficient than solid ones. In the newest Parseval ships they are made semi-rigid—just stiff enough to preserve their shape when at rest—as a matter of convenience.

The Parseval power plant has been brought to such a state of reliability that it should furnish a fitting model for any kind of aircraft, especially flying ma-

(*Continued on page 133.*)



Diagrams showing the constructional details of the Parseval airship.



The Zeppelin. The Parseval. The Gross.

Three typical German airships.

THE ZEPPELIN AIRSHIP.

MAGIC FOR AMATEURS—VI

ROD, TUBE AND COIN TRICKS

BY W. H. RADCLIFFE

NO. 13. A HINDOO HOODOO ROD TRICK.

No veiled seventh daughter of a seventh daughter can afford greater satisfaction and amusement to an evening gathering than the simple device about to be described. To be shown to best advantage, the services of an assistant and a rather dimly lighted room are necessary.

Procure a smooth metal rod about twenty inches long and from one-quarter to three-quarters of an inch in diameter and mount this upon a base so that it stands upright. (The vertical supporting rod and base of a student's lamp answers the purpose exactly.) Place the rod on the table where it is later to be exhibited, make a loop in a black linen thread which can quickly be tightened about the top of the rod and lay this end of the thread on the table, slipping a pencil stub about one inch long through the loop to enable the thread being readily picked up without notice. Then lead the thread over a hook-screw fastened to the wall on a level with the top of the rod and directly behind it with respect to the audience. From the hook-screw carry the thread within easy reach of the assistant who may occupy a front seat among the spectators.

If the assistant can get behind the wall or door which otherwise would furnish a support for the hook-screw as just explained, and a small hole can be bored through the partition, the thread may be led from the rod through the hole and directly to the assistant, the object in either case being to have the thread hidden behind the rod from the audience. The arrangement in the latter case must be such that the assistant can hear the questions asked by the audience. To facilitate this, the performer may repeat the question each time in a loud voice.

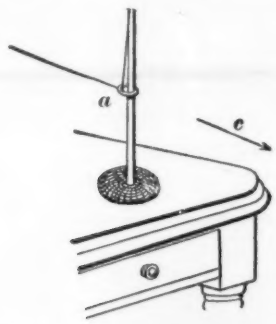


Fig. 19.—THE RING ANSWERS QUESTIONS, MOVING UP THE ROD FOR "YES" AND DOWN FOR "NO."

In introducing the trick, explain that the rod is of Hindoo origin and possesses the wonderful power of answering questions. Pass the rod and its base around for examination and then place it upon the table near to the anchored end of the thread.

Pick up the pencil stub and thread, and tell the audience that it is quite necessary to first have a pencil stub balanced upon the rod. In endeavoring to do this, secretly slip the thread off the pencil and over the top of the rod, drawing the loop in the thread tightly about the rod. When the pencil has at last been balanced upon the rod, request some one in the audience to lend you a ring (a heavy plain wedding ring is the best.)

Slip the ring over the pencil, rod and thread, guiding the ring down the rod till it rests upon the base. Then remove the pencil stub and hand it to the audience, explaining that it is necessary for the one who asks the rod a question to hold the pencil until the answer has been received. If the correct answer to the question is "yes," the ring will ascend the rod; if "no," the ring will descend.

While the performer is saying this, the assistant should gain control of the thread, and when the performer requests the ring to prepare itself for questions, the assistant should pull the thread so as to raise the ring half-way up the rod. The apparatus as seen by the performer from the side would then appear as at *a* in Fig. 19, the audience being seated in the direction indicated by the arrow *c*.

An effective feature of this trick is the freedom with which the performer can slip the ring off the rod at any stage of the performance after the thread has been fastened in place, and hand it out for inspection, simply slipping it back on the rod for further use. At the close the performer asks the ring if it is tired, whereupon the assistant gives the thread a jerk, which throws the ring off the rod and into the hands of the performer.

NO 14. A MYSTIC TUBE.

A paper tube five or six inches long and about one inch in diameter will furnish an optical illusion so perfect that the mysterious effect produced may be attributed to the magical influence of the performer's breath upon the tube, without much chance of contradiction.

Take a sheet of note paper, roll it into a tube of the size mentioned and slip an elastic rubber band around it to prevent it unrolling. Breathe mysteriously on the tube and then hand it to one of the spectators, requesting him to hold it between the thumb and fingers of his right hand against the right edge of his left hand as indicated at *a*, Fig. 20, and in line with his eyes. Tell him to keep both eyes open, looking directly at the inside of his hand with the left eye and through the tube with his right eye.

Fig. 20.—AN ILLUSION DUE TO LAPPING OF VISION.

He will presently see what appears to be a circular hole inside the right edge of his left hand, the effect being as though he were looking directly through his left hand. Although as previously stated the trick may be attributed to the magical influence of the breath upon the tube without much chance of contradiction, the illusion is really due to the lapping of the vision of the left eye over that of the right eye, which latter is confined within the boundaries of the paper tube.

NO. 15. THE VANISHING COIN.

A pasteboard or wooden pill box one-half or three-quarters of an inch deep and seven-eighths of an inch inside diameter is here required. Two five-cent coins of the same date are also needed. One of the coins is hidden in a certain part of the audience room, and the other is used in connection with the box, Fig 21.

The entire interior of the box, including the cover *a*, is painted or inked black, and the nickel or coin *c* used with the box is covered on the side where there is no date with paper also painted or inked black. The paper should be pasted smoothly on the coin and trimmed closely about its edges. The box and cover are passed around for examination, but the prepared coin is held concealed in the performer's left hand. A five-cent coin is borrowed from one of the spectators and received by the performer in his right hand. He apparently transfers it to his left hand, but in reality retains it in his right hand, and under cover of reaching for a handkerchief in his pocket drops it therein. When the box is returned, the coin in the left hand is shown with its uncovered side to the front

Fig. 21.—PILL BOX AND COIN IN COMBINATION FOR USE IN BLACK ART TRICK.

so that the spectators can see the date, and is dropped into the box in full view of the audience. As it is lowered into the box, however, it is turned with its paper side up. The box is then closed and shaken up and down to prove by the noise made that the coin is still inside.

The performer now fans the box for a few seconds and repeats the following incantation:—Hanky-panky, hocus-pocus hunky-bunky my, one I say, two I say, three I say, fly!

The box is then shaken crosswise. No noise is heard because there is no space inside for the coin to move laterally. As the indications are that the coin has vanished, the cover is taken off and the box shown to be empty. The reason the box appears empty is that the black side of the coin being uppermost is indistinguishable from the black interior of the box, and being of nearly the same diameter as the box, appears like the bottom.

Having satisfied the spectators that the coin has vanished, direct the one from whom the nickel was borrowed to search for it in a certain part of the room, that part of course being designated in which the nickel was previously placed. When he has found it, ask to have it recognized by the date on it as the one previously obtained, thank him for the use of the coin and wish him always his present luck in recovering the money he lends.

Another Undesirable Citizen Barred.

It is not generally known that the Secretary of Agriculture is the arbiter of the fate of birds and beasts brought into this country.

It is also not generally known that in order to bring into this country any bird or beast a special permit must first be obtained from the Department of Agriculture and that a record is kept of such importation. This order was enacted into a law for the purpose of preventing certain varieties of birds and beasts being introduced into the United States which might become great pests.

Among those which the government has deemed undesirable, and which are known for their destructiveness, are the English starling, similar to our robin and a fruit eater, thrush, goldfinch, and great titmouse. The flying fox, or vampire bat of India, and the mongoose are as carefully excluded as would be the plague, the Department having the power to do this against any bird or animal when at any time it sees a possibility of its becoming a menace.

For this reason the Secretary of Agriculture, through the Treasury Department, has issued to customs inspectors a circular whereby the English starling has been placed upon the prohibited list, having in mind the experience already had with the English sparrow.

The results of the starling importation are already being tasted by this country. The bird was first brought here some years ago and has spread very rapidly. As it is an eater of small grain, it is feared that if it once gets into the wheat belt there will be serious trouble.

The starling is a native of Europe and is not a very troublesome bird in its native country, any more so than the sparrow, but Australia and New Zealand have had experience with it and characterize it as a pest.

From an insect-eating bird it soon enlarged its field of operations and not only became a fruit eater and pest to the grain farmers, but it began to eat the desirable insects and the eggs and young of the native birds.

The starling is nearly as large as our robin, though it is trimmer and of slighter build, and its plumage is more attractive than the dull brown of the sparrow. It is not as aggressive as the sparrow, though larger.

The Agricultural Department has been hard put to determine where to draw the line between the damage that native birds do in eating fruit and in destroying insects. The robins, catbirds, and martins are confirmed small-fruit thieves, and yet all of them are considered as worthy of protection for their insect eating. While this is true of the above-mentioned birds, the starling goes them one step better and has taken to grain to such an extent, and has become such a menace, where once it was a protected bird, that the ban has now been lifted and anyone is free to kill it.

The Department has found a curious fact in connection with the so-called beebird which appears in great abundance in the South and West. It is a little dark-green bird, with a crimson tuft of feathers on top of its head. This tuft, which is usually hidden, can be raised and looks like a small red flower. It is a bait for insects, and the bird gets its name from the bees on which it principally feeds.

It has been found that the bees which it eats are nearly all drones. Whether the bird has some way of telling a drone from a stinging worker is not known, but it is a fact that it eats drones almost to the exclusion of the working bees. It also destroys a good many other noxious insects, and is considered valuable for that reason, while the damage that it does to beekeepers is infinitesimal.

LUTHER BURBANK'S WONDER

BY CHARLES

The chronology of the Burbank creations and ameliorations has never been published. In presenting this, the reader should be informed that these survivors of their producer's rigid exactions have received during their history two and sometimes three names. At first, they were merely numbered, separated from their companions by an epithet, or nicknamed for field reference. Then, when proven, they were given in the bulletins less domestic and unscientific designations; as, at christening in the Roman Catholic communion a saint's name is given to the child. Finally, when turned over to the nurseryman for distribution, he gives them in his catalogue more high sounding and generally more assuming titles for which the originator is mistakenly held responsible by the public. For instance, that latest-appearing culture—now in controversy—the cross of the African stubble-berry (*Solamun guinceuse*) with the Pacific coast (*S. villosum*) was called the "Sunberry," when it was graduated from the experiment grounds. It came advertised to the public as the "Wonderberry."

The registry begins in 1873, when Mr. Burbank, then 24, answered the demand for a potato which should yield 200 bushels to the acre, with the famous seedling from the "Early Rose" (itself from seed of a garnet Chile plant) which at once gave a yield of 435 bushels, and has since produced 525 bushels. With its proceeds, $125, Mr. Burbank arrived in Santa Rosa, California, in October, 1875. Five years of severe ordeal, poverty, starvation, discouragement well-nigh fatal, awaited him. At last he was able to buy four acres of the soil for which he had crossed the continent. His own words are:

"In 1880 I began paying especial attention to the Rubus family. I had in my collection of blackberries and raspberries nearly all the popular varieties. In 1883, I began crossing. In 1884, I had about 60 hybrids, the first ever produced. The next season more extensive trials were made with many new subjects." (He now possessed 10 acres, home land). "From hybrid seeds of the third generation, I obtained black, red and yellow raspberries, white, black, red and pink blackberries, in every possible combination of sizes, colors, qualities and flavors. Many were totally barren, some, with long, trailing vines; some, stiff and upright as a currant bush; some thorny, others as free from thorns as currants; still others producing leaves, flowers and fruit perpetually. Then there were others growing into canes 3 to 4 inches in circumference, others 20 feet long on the ground or straight 10 feet high. But from all these were presented more radical improvements in blackberries and raspberries than had been obtained for eighteen centuries."

The list of the main species incorporated to establish these hybrids is too long to print. The photographs of the leaves of different individuals show remarkable variations and eccentricity, a few offering but a single leaf, or leaves, as reticulate as ferns; many profuse and palmate. The results in their entirety made the scientific botanists' barriers between species and varieties, to use the audacious horticulturists' word, "wobble."

1884 witnessed the announcement of the "Japanese Golden Mayberry," and the "Primus." The distinction of the former was that it led far in advance the berry season, the earliest raspberry known, ripe while yet the standards were well-nigh dormant. It was a blend of the Cuthbert with a diminutive variety of *Rubus palmatus*, characterized by Mr. Burbank as "one of the most worthless, tasteless, dingy, yellow berries I have ever seen." The new fruit is large, sweet, glossy, semi-translucent, growing on bushes resembling trees, six to eight feet high. The Primus is now grown extensively in semi-tropical climates, thriving especially in the Philippines. It ripens a month before either of its parents, the wild dewberry (*Rubus ursinus*) and the Siberian (*X Rubus crataegifolius*). It produces a large and perfectly black fruit in abundance, a distinct new race of the garden berry. The seedlings of this pioneer have taken their places as standards in various localities.

In 1886 the experiments had become more extensive. He was crossing the Satsuma and other Japanese plums with the Eastern, European and California, Nevada and Oregon natives, many of which in size and clustering growth are grapes rather than plums. "Some of them are of very little value," remarked Mr. Burbank, "having an unpleasantly bitter taste, reminding one of the eastern cranberry." The famous walnut hybrids are now under culture.

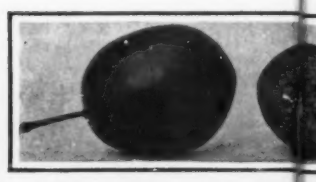
But, important as these successes were, they were only in a way by-products. Mr. Burbank's main business had been to entrench and establish himself. To this end, he had built up the largest and best-stocked nursery west of the Mississippi. For years he had resumed the habit begun as a boy on his fragment of soil at his home in Lunenberg, Mass., of taking the premiums at the State and county fairs; and his reputation for integrity and liberality in dealing was fully substantiated. In 1888 he sold one-half of his nursery (which was yielding a clear profit of $10,000 per annum) for $13,000, and focused on his life work the far less promising venture of plant-breeding. He purchased the large experiment grounds at Sebastopol.

The ennobling of the plum stands perhaps foremost in Mr. Burbank's work; and the following year (1890-1891) saw the first twelve of the new varieties which were to distinguish it. They were the "Burbank," so named by Prof. H. E. Vandeman of the United States Department of Agriculture; "Satsuma," "Botan," "Chabot," "Long Fruit," "Maru," and six other varities under numbers as received from his collectors. The last four of these were named by P. J. Berckmans of Augusta, Ga., president of the American Pomological Society. Prof. L. H. Bailey named the "Berckman," "Humi," "Blood," "Willard." 1891 also saw the delivery to fruitgrowers of the "Phenomenal" berry, which has since made half-acres more profitable than farms.

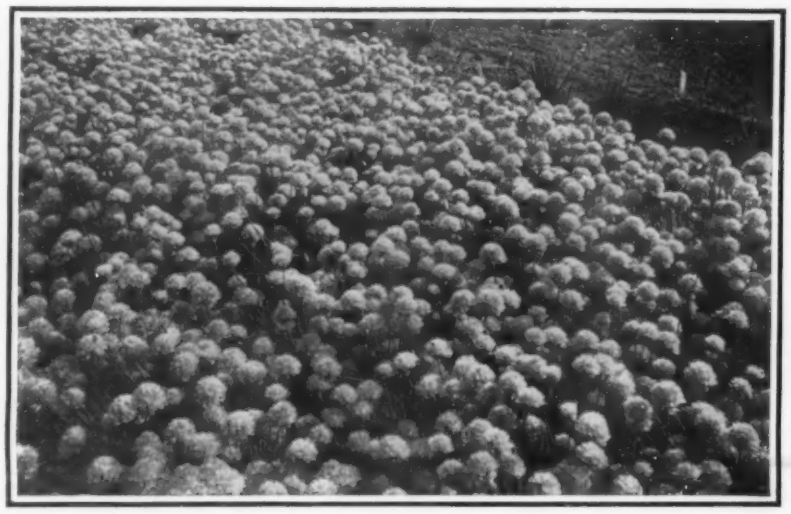
In the exhibition of the California Floral Society, 1892, the prominent feature was Burbank's new Gladiolus, the "California," a large double flower with a solid cone of blossom, 5⅛ inches expanse of petals clustered on stiff, compact low-growing stems, flowering so profusely as to hide the stem on all sides. Compared with the thinly scattered blossoms on but one side of the weak-stemmed ordinary flower, it looked like a new race. It came from the common Gardanensis type as a basis with bulbs from South Africa; and is so vital that even in the scorching sun and wind of inland California, the last flower

A new loquat; fruit favorite in China, Japan and southern states.

Burbank's new semi-double shasta daisy.



Stoneless prunes. Kernel full[y] substance intervenes b[e]



Burbank's new rosy-crimson chives, showing astonishing blooming qualities.

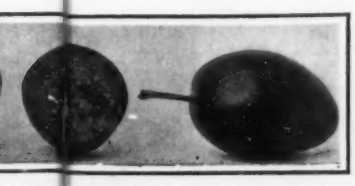
A new flowering allium.

View of corner of ho[me] grou[nds]

BURBANK'S WOR[K] H[ere]

RFUL WORK IN HORTICULTURE

ES J. WOODBURY



nel full developed but naked; no hard venes tween it and the pulp.

Branch of sunberry plant, the fruit sensation of last season.

Feijoa sellowiana, a fruit never before grown in United States.

Gigantic platystemon, native cream cup of California greatly improved.

Burbank

round in Santa Rosa.

Native California golden-leafed chestnut, showing its ornamental value.

HORTICULTURE.

to bloom on the stalk finds the first unwithered. The same year "Hale," and "Abundance," the latter so named from its ropes of fruit and afterward renamed "Alhambra," and the first perfect freestone of Japanese blood, were added to the list of plums. In June, 1893, was published the now historic "New Creations." The stir this pamphlet made was immediate and far reaching. Its bold claim that the new fruits and flowers it described would inevitably displace present standards, the extensive biological knowledge it displayed, its high scientific character and the grace and dignity of its style, ushered it into an appreciation quite outside of the attention usually accorded to the presentations of plant growers. It was sought by students of plant science; received the indorsement of the authorities; was adopted as a class book in universities of this country and abroad. Its singular illustrations from actual photographs were convincing of its statement that "the life forces of plants may be combined and guided to produce results not hitherto imagined," and that "we are now standing at the gateway of scientific horticulture." Among the new fruits it presented, now prominent, were the "Perfection" (the present popular "Wickson"), "Delaware," "Shipper," "Gold," with as many more hybrid and cross-bred plums; the "Eureka," "Dictator," "Paradox," "October Giant," "Autumn King," with other berries and crosses; the peach × almond, × Japan plum, × Chickasaw, × apricot; the almond × Japan plum; apricot × the same, pyrus japonica × quince; quince × crabapple; Chinese quince × apple and others. Then there were shown seedlings of the new "Seckel Pear"; five new quinces, including the famous "Childs" and Van Deman; new potatoes, one of them the peculiar "Aerial"; the begonia-leaved squash and the cross-bred tomatoes. The flower lists include half a dozen new roses and as many more callas and lilies; the "Silver-Lining" poppy, a new myrtle; hybrid clematis; hybrid nicotianas, and a new family which the author names "Nicotunia," a union of large flowering nicotianas with petunias; new ampelopsis veitchi; wax myrtle; seedling tigridias; new cannas, arums, amaryllis, brodias, aquilegias, asters, etc. The frontispiece is a photograph of leaves from the new walnuts, *Juglans Californica* × *J° Regia and Juglans nigra* × *Californica*. A magnificent row of the former lines the roadway in front of the Burbank home gardens. The trees are twice the size of the ordinary walnut at double their years. They grow twice as fast as the combined growths of both parents. The latter produces prolifically nuts three times the bulk of the ordinary American or California varieties. With these is announced the Japan Mammoth Chestnuts, since named the "Hall."

1894, second edition of "New Creations." Announcement of the cross-bred Japan plum "Prolific," finest of the first crosses. Appear, also, the cross-bred white blackberry "Iceberg," the blackberry-raspberry hybrids, "Humboldt" and "Paradox," a new race of clematis; new callas; "Snowdrift" and "Fragrance," Ostrich Plume, Waverly, Double Jackmaurie and Sanguinosa types, seedlings of Pyrus Japonica, and the new rose, "Peachblow."

1895, a group of hybrid lilies and the "Burbank" and "Tarrytown" cannas are announced; also the "Apple," "America," "Chaleo," "Bartlett," "Shiro" and "October Purple" plums, the latter a cross of Satsuma and a Japanese seedling, the "Giant" prune and three new chestnut seedlings, "Coe," "McFarland," and "Hale," offspring of the Japan Mammoth.

No more introductions were made until 1898-1899, when appeared the "Climax" and "Sultan" (cross of Wickson and Satsuma) plums, the pineapple quince and the third and the fourth editions of "New Creations."

1900, Mr. Burbank's substitute for the French prune, the "Sugar" prune as given to the market. Since known as "Splendor," the original name is derived from the proportion of sugar in the fruit, 24 per cent; the French variety carrying 18½. It has displaced the French variety which had been the only reliance of fruit growers. Appear also this year the new winter apple Gravenstein type; other hybrid plums; the "Oriental" poppy, hybrid tigridias and clematis and a new canna of the Crazy type.

1901, fifth edition of "New Creations" and a supplement are issued. Announcements are made of the "First" and "Combination" plums (this is a cross of 8 varieties); the improved beach-plum, the stoneless plum, the Himalaya blackberry, the cross-bred peach, "Opulent;" the apple, "Winterstein;" the new asparagus "Quality;" a new rose, "Coquito;" the "Elegance" verbena; brilliant hybrids of the Mexican shellflower, the "California" and "Shirley" poppies; a new strain of perennial peas and that permanent floral wonder, the Shasta daisy.

1902, publication of "Fundamental Principles of Plant Breeding," introductions of the "Maynard" plum (*Ptrifiore* × *P Scinoni*); the new cherry, "Early Burbank," now known as the Vacaville cherry, that town's main fruit-export, and a variant of Brodiæa with bloom six times that of the ordinary flower.

1904, introductions of "Doris" and "Giant" plums, the Crimson Winter Rhubarb and three new strains of the Shasta daisy, "Alaska," "California," "Westralia."

1905 was a year of flower novelties embracing the "Australian Star" Flower, "Lace" Flower, new strains of *mimulus Luteus*, cardinalis; erysimum grandiflorum, *crizonum umbellatum;* Hencheria cust Ala, the new foliage plant, and many others.

1906, 1907, appear the "Santa Rosa," "Formosa," "Vesuvius," and "Gaviota" plums and the "Plumcot," a union of the plum and apricot.

The latest cultures attaining maturity comprise the Spineless Cactus and other redemptions of the Opuntias, the Sunberry Plant, Stoneless Prune, Loquat (started 1889), semi-double Shasta Daisy, Gigantic Platystemon, new Chives, Flowering Allicum, Feijoa Sellowiana or Naehea and Native California Golden-leaved chestnut.

Four years ago Mr. Burbank received from North Africa a poppy plant of strange species. He crossed it with the "Shirley" poppy and the tulips. The last result is a new variety of the Papiver family, longer, brighter, and possessing greater contrasts of color. He has also just matured an evening primrose, pure white and five inches in width, nearly double the diameter of any known species. These are the horticulturist's latest productions.

THE INVENTOR'S DEPARTMENT

SIMPLE PATENT LAW; PATENT OFFICE NEWS; INVENTIONS NEW AND INTERESTING

The Editor will pay for short articles available for this department

A SIMPLE EXPLANATION OF THE PRINCIPLES INVOLVED IN THE WRIGHT PATENT SUIT.

Drop a flat piece of cardboard from your hand. It will fall. But as it falls its surface will offer a certain resistance, so that it becomes in effect a parachute. The amount of its resistance will depend on the amount of its surface. If the cardboard be driven to the left, as shown in Fig. 1, it will still fall, but along an inclined path. In other words, it will fall while advancing and advance while falling.

Suppose that this same piece of cardboard, this aeroplane, as we may well call it, is inclined to the wind and that it is driven along a horizontal path *B* in the direction of the arrow *A*, as shown in Fig. 2. If it were not driven forward the cardboard plane would fall by reason of its weight. But since it is driven forward and since it is inclined to the air, it

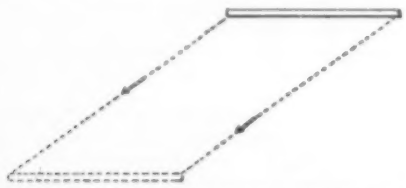


Fig. 1.—FALL OF A HORIZONTALLY PROPELLED PLANE.

offers resistance, which means that pressure is exerted upward against its lower surface. The driving power, whatever it may be, overcomes the resistance or pressure; yet the effect of the resistance or pressure is to keep the plane up in the air. So the plane tends to slide up diagonally on the resisting air; gravity (weight) tends to draw the plane down toward the earth, and the diagonal sliding action tends to move the plane farther from the earth. This climbing effect is obviously dependent on the angle of the plane. If the angle is large it is great; if the angle is small it is slight. Given a very high speed of propulsion, a

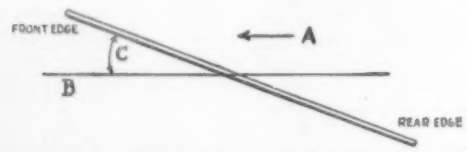


Fig. 2.—INCLINED PLANE DRIVEN THROUGH THE AIR.

speed greater than the falling tendency, and the plane is bound to rise. Given a speed of propulsion less than the falling tendency and the plane will sooner or later settle to the ground. Horizontal flight can therefore be maintained by proper adjustment of speed and angle.

This angle at which the plane moves against the air is known as the "angle of incidence." It is positive, because it has a tendency to lift. If the plane were tilted forward or dipped, the sliding effect would be earthward. Indeed, so marked would be this effect that the plane would reach the ground much more quickly than if it fell simply by its own weight. In

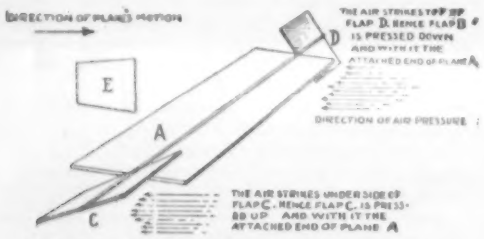

DIRECTION OF PLANE'S MOTION
THE AIR STRIKES TOP OF FLAP D, HENCE FLAP D IS PRESSED DOWN AND WITH IT THE ATTACHED END OF PLANE A
E
D
A
DIRECTION OF AIR PRESSURE
THE AIR STRIKES UNDER SIDE OF FLAP C, HENCE FLAP C, IS PRESSED UP AND WITH IT THE ATTACHED END OF PLANE A
C

Fig. 3.—BALANCING A PLANE IN THE AIR.

that case the angle of incidence is negative, because it depresses.

It is therefore evident that an advancing aeroplane may be caused to travel up or down simply by making the angle of incidence positive or negative.

During flight a Wright or Curtiss or Blériot machine is subjected to every whim of the air. There are countless gusts, eddies, pools, currents, and the like which tend to tip the plane and change the angle of incidence. These incessant variations of the air must all be counteracted; otherwise the machine will capsize.

It happens during flight that the aeroplane, because of the wind's caprice, drops more on one side than on the other. To maintain his balance, the aviator must in some way lift the falling side or lower the rising side, or do both. It was this problem that long baffled the inventor of aeroplane flying-machines. The whole art of machine flying is summed up in its

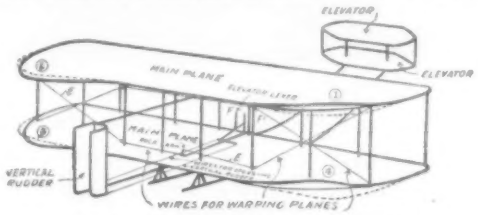


Fig. 4.—WRIGHT SYSTEM OF CONTROL.

successful solution. To the Wright brothers of Dayton, Ohio, belong much of the credit of having devised the first and thus far the most efficient means of solving that problem, a means now embodied in almost every successful flying machine.

Suppose that the plane *A* in Fig. 3 is provided at each side with tips *C* and *D*, hinged so that they can be swung up or down. If these two tips (*ailerons* the French call them) are swung so that they lie flush with the main plane *A*, they have no effect whatever beyond adding to the amount of supporting surface. Suppose that the near side of the plane drops. In that case the tip *C* is raised as shown in Fig. 3. What happens? More resistance (pressure) is offered to the air at that side, so that the plane is restored to its former position of equilibrium. To assist in this restoration, the tip *D* at the farther side of the plane can be tilted down, so that its angle of incidence is negative or depressive. Hence the far end of the plane is lowered while the near end is raised. In most flying machines this dropping of one tip and raising of the other is effected simultaneously by a system of cables and levers. When the plane's balance has been regained, the tips are swung so that they lie flush with the plane *A*, and become virtually part of the plane.

In the Wright aeroplane, instead of employing movable ailerons, the operator warps the outer rear edges of the planes. The end of the plane which is depressed has a greater downward curve put into it, while the other end is flattened out. The greater curvature, while it causes a greater lift, also produces more head resistance and thus gives the aeroplane a tendency to turn upon its vertical axis. This the Wrights correct by turning the vertical rudder toward the end of the plane having the least curvature. The wind pressure on the rudder exerts a counteracting force at the rear of the machine and opposes the tendency of the machine to turn. Hence the vertical rudder serves the double purpose of steering and of preventing the spinning of the machine about its vertical axis.

The actual controlling method employed by the Wrights is shown in Fig. 4. Instead of one plane, the Wrights employ two superposed planes connected and trussed together. In front is a horizontal rudder or elevator to steer the machine up or down, which rudder or elevator consists of two superposed planes, although one would probably answer, and which is operated by the lever *F* through the medium of connecting rods. In the rear are the vertical rudders, which serve to steer the machine from side to side and to co-act with the main planes in keeping the machine on its course. Instead of employing hinged tips like those shown in Fig. 3, the Wrights warp the corners of the planes. Thus, when the corner 1 is turned up, the corner 2 is depressed, while simultaneously the corner 3 is depressed and the corner 4 is elevated. This simultaneous elevation and depression of corners is produced by a cable *E*, attached to a lever F^1. By throwing the lever from side to side the planes are warped. They do not turn upward, however. The vertical rudder is connected by tiller ropes with the same lever F^1, and is swung by moving the lever F^1 back and forth. Hence the planes are warped and the vertical rudder properly turned by the one lever F^1.

The various machines which Mr. Glenn H. Curtiss has flown are similarly provided with two superposed main planes and as shown in Fig. 5, with a box-like horizontal rudder in front and a rear vertical rudder. The front horizontal rudder is swung up or down by means of a rod connected with a steering wheel, the wheel being pushed or pulled by the pilot for that purpose. The same wheel, when turned similarly to the steering wheel of an automobile serves to swing the vertical rudder by drawing on one or the other of the tiller ropes. In his earlier machines Curtiss employed supplemen-

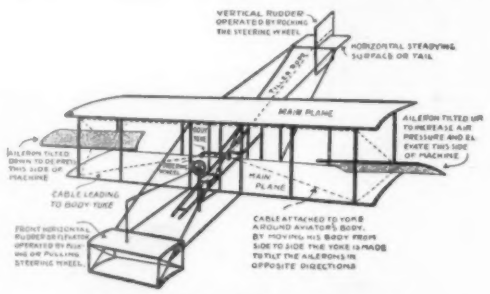

VERTICAL RUDDER OPERATED BY ROCKING THE STEERING WHEEL
HORIZONTAL STEADYING SURFACE OR TAIL
MAIN PLANE
AILERON TILTED UP TO INCREASE AIR PRESSURE AND EVADE THIS SIDE OF MACHINE
AILERON TILTED DOWN TO DEPRESS THIS SIDE OF MACHINE
CABLE LEADING TO BODY YOKE
MAIN PLANE
CABLE ATTACHED TO YOKE AROUND AVIATOR'S BODY. BY MOVING HIS BODY FROM SIDE TO SIDE THE YOKE IS MADE TO TILT THE AILERONS IN OPPOSITE DIRECTIONS
FRONT HORIZONTAL RUDDER OR PLANE OPERATED BY PUSHING OR PULLING STEERING WHEEL

Fig. 5.—CURTISS SYSTEM OF CONTROL.

tary plane tips, very much like those represented in Fig. 3. In his later machines, however, he has transferred the tips from the sides of the main planes to positions between the main planes, beyond which they project, as indicated in Fig. 5. Despite the transfer their purpose still remains the same. To swing the ailerons or supplementary planes in opposite directions, cables are connected with the seat-back, which moves from side to side and which partly encircles the pilot's body. By throwing his body from side to

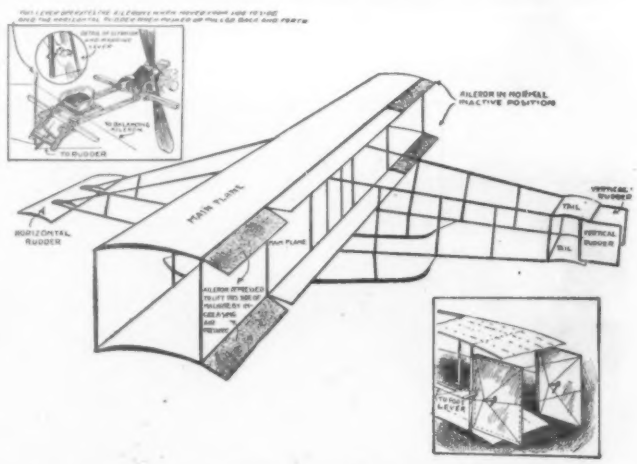


Fig. 6.—FARMAN SYSTEM OF CONTROL.

side the pilot swings the ailerons in opposite directions. The effect is exactly the same as if the main planes were warped, as in the Wright machine. Whether or not it is necessary to throw over the vertical rudder when the ailerons are swung is the question at issue in the patent infringement suit instituted by the Wright brothers against Curtiss. The Wrights claim that Curtiss cannot fly unless the vertical rudder is operated simultaneously with the ailerons. Curtiss claims that he can. Much testimony has been taken on both sides. A United States Circuit judge thought that the preponderance of expert evidence was on the side of the Wrights, particularly since Curtiss himself admitted that he did sometimes use the vertical rudder to offset the swerving of the machine caused by changing the inclination of the ailerons. An injunction was therefore issued, which on appeal, however, was dissolved. Whether or not Curtiss can fly without simultaneously operating his vertical rudder and his ailerons will be decided when the question of infringement is settled at the final hearing.

In the Farman biplane, which was flown by Paulhan in this country and which the Wright brothers allege likewise infringes their patent, the ailerons, illustrated in Fig. 6, form part of the main planes. They are the hinged flaps at the rear corners of the main

pinnes. They are operated by a vertical lever conveniently placed at the pilot's right hand. This lever also works the front horizontal rudder and, in conjunction with it, the rear ends of the two tail surfaces in the latest Farman biplanes. The latest machines also have but a single vertical rudder between these tail surfaces. This is worked by a tiller that is rocked from side to side by the pilot's feet. When the aeroplane tips to the left, for example (see diagram), the pilot swings his control lever to the right, thus pulling down on the flaps at the left-hand end of the planes and creating more lift on this side. The right-hand flaps remain horizontal, held out by the air pressure. (When the machine is at rest on the ground, all four flaps hang down vertically.) The Wrights assert that an aeroplane having its transverse equilibrium maintained in this way has a tendency to turn upon its vertical axis and that this tendency must be corrected by turning the vertical rudder toward the high side of the aeroplane. This particular movement of the vertical rudder in conjunction with the warping of the wings is the chief claim of the Wright patent. The Wrights maintain, also, that ailerons are simply a mechanical equivalent for wing warping. From tests that have been made with machines of the Curtiss and Farman types, it seems to have been proved that when the tipping of the aeroplane is only slight, the vertical rudder does not have to be used; also monoplanes having a long tail, such as the Antoinette, are said to have flown successfully without a rudder.

The Blériot monoplane, which was brought to the United States by Paulhan, and which is also involved in this litigation, is outwardly at least more like the Wright machine in the mechanism for maintaining side-to-side balance. Its single supporting plane is warped at the sides by a lever and a system of cables, as shown in Fig. 7. Its single propeller, however, is mounted at the front and not at the rear of the machine. The single supporting plane is rigidly trussed along its front edge, but a cable is attached to one rear corner, and passes downward, and toward the

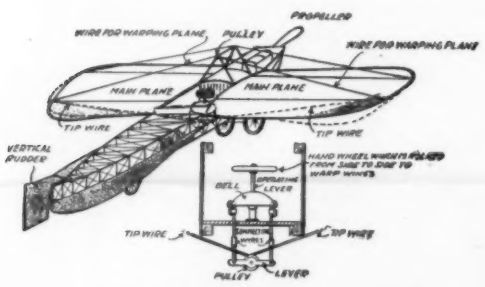


Fig. 7.—BLÉRIOT SYSTEM OF CONTROL.

center to a pulley actuated by a lever, and upward to the opposite rear corner of the plane. By moving the pulley lever to one side, the cable pulls down the side rear portion of the plane at one tip to a greater angle of incidence than the normal, and permits the rear portion of the opposite side to rise to an angle of less incidence. Thus the whole plane is warped, and the portions lying at the opposite tips are presented to the air at different angles of incidence. The vertical adjustable rudder is located at some distance to the rear of the main plane, and tiller ropes lead from it to a lever operated by the feet. When the pilot warps the plane he swings the rudder to prevent the machine from spinning.

The foregoing explanation of stability and stabilizing devices applies only to lateral balance. Fore-and-aft balance can be obtained as in kites by tails, such as are found in the Curtiss, Blériot, Antoinette, Santos-Dumont, Esnault-Pelterie and other machines. The Wrights formerly flew without a tail, depending entirely on the horizontal rudder or elevator to check pitching. In the later models of the Wright machines a single tail surface has been introduced, as for example in the biplane with which Rolls crossed and recrossed the English Channel. The addition of a tail, however, necessitates additional driving power.

A Patent Interference Puzzle.

To the Editor of the SCIENTIFIC AMERICAN:

Sir: The undersigned is a patent solicitor and the following question in Patent Office practice has come up and is proving a poser for him and other patent men to whom he has submitted it.

There are pending in the Patent Office three applications for the same invention and the facts are as follows:

A. conceived the invention in 1905 and had drawings for a patent application made at that time. These drawings were put away and nothing was done with them until March, 1909, when the application, including these drawings, was prepared and filed.

B. conceived the invention in January, 1909, and filed his application in February, 1909.

C. conceived the invention in December, 1908. He immediately went to work on a machine and worked on it constantly, reducing the invention to practice in April, 1909. He filed his application in May, 1909.

If A. and B. are put into interference to determine the question of priority of invention, B. will prevail because the filing of his application in February is a constructive reduction of the invention to practice, and A.'s application was not filed until March. Although A. was the first to conceive the invention, his lack of diligence is fatal under the Patent Office practice.

In an interference between B. and C., C. would prevail because, although the last to reduce to practice, he was the first to conceive and his conception and reduction were coupled by diligence.

In an interference between A. and C., A. would prevail because he was both the first to conceive and the first to reduce to practice, and under these circumstances he is not chargeable with lack of diligence.

The situation therefore is that B. can beat A., C. can beat B., and A. can beat C.

Who gets the patent? R. H. STROTHER.

[The above communication has been referred to us by the Editor of the SCIENTIFIC AMERICAN for comment. From the brief statement of facts submitted, it is probable that in three separate interferences B. will prevail as against A.; C. will prevail as against B., and A. will prevail as against C. The reasons for the decisions in the first two of the supposed interferences hold good irrespective of the presence or absence of a third party, but in an interference between A. and C., A. wins only on the assumption that, being the first to conceive, he files his application when the field in the Patent Office is still unoccupied, and is thus senior party. As soon as B. is taken into consideration in connection with A. and C., A. is then no longer senior party and is not entitled to the benefit of being the first to file. He no longer receives the benefit of the principle that the senior party cannot be charged with laches. He is undoubtedly guilty of laches from the time B. files his application in February until A. himself files his application in March, and he probably could be charged with laches from the time C. first entered the field the previous December. It is evident, therefore, that C. should be considered the prior inventor and entitled to the patent at issue.

MUNN & Co., Patent Attorneys.]

LEGAL NOTES.

An Important Copyright Decision.

What constitutes an infringement of a copyrighted story? The play which is known to many theatergoers in the United States as "The Heir to the Hoorah" recently figured in a copyright infringement suit. The author of a story called "The Transmogrification of Dan," which appeared in a popular magazine, sued the author of the "Heir to the Hoorah" because the dramatist had expanded the plot, using the story for a framework. The author had sold his story absolutely to the magazine, which had copyrighted it by entering the title of the magazine for copyright. On the author's request the publisher assigned the copyright to him, together with its existing right of action. He then brought suit for an infringement against the theatrical company for presenting a play through an arrangement with the playwright.

The outcome of the case, as it came up before the United States Circuit Court of Appeals, is recorded in Dam vs. Kirk La Shelle Co., 175 Federal Reporter, 902. It was held that although the play has more characters, many additional incidents, none of the language of the story, and the characters have different names, the right given to an author to dramatize his work includes the right to adapt it for representation upon the stage, which must necessarily involve changes, additions, and omissions, it being impossible to make a play out of a story—to represent narrative by dialogue and action—without making changes, and the playwright, having appropriated the theme of the story, could not escape the charge of infringement.

An Arkansas statute provides that every negotiable instrument taken in payment for a patented article must be executed on a printed form showing that it was so taken. It is held by the United States Circuit Court of Appeals for the Eighth Circuit in Ozan Lumber Co. vs. Union County National Bank, 145 Federal Reporter, 344, to be unconstitutional, for the reason that it creates a discrimination between the articles of property of the same class or character, the discrimination being based on the fact alone that the article is protected by a federal patent. The court distinguishes several somewhat similar enactments in other States, and points out that, if such a statute could be lawfully enacted, the State might with equal reason destroy the negotiability of notes taken by national banks or by citizens of other States, or in interstate commercial arrangements, etc.

A trade name does not necessarily give one the exclusive right to make or sell a certain kind of goods, is the decision in the Supreme Court of Michigan in Warren Brothers vs. Barber Asphalt Paving Co.

The Supreme Court of Michigan in Warren Brothers vs. Barber Asphalt Paving Co., 108 Northwestern Reporter, 652, holds that where a city calls for proposals for the construction of "Bitulithic" pavement, and requires the pavement to be made according to certain specifications, a company might be awarded the contract for the work, although another company has habitually used the word "bitulithic" as a name for the particular pavement made by them, and had had this trade-name registered and also filed for record as a trade-name in the office of the Secretary of the State of Michigan. The court says that the injunction must be denied because a trade-name does not give one the exclusive right to make or sell a given kind of goods, the trade-name being simply to point out the origin or ownership of the article to which it is affixed for the protection of the consumer.

A case is reported in 117 Southwestern Reporter, 214, which should interest telephone subscribers in general. A plaintiff named Solomon sued the Southwestern Telegraph and Telephone Co., and had a contract for general service. His wife becoming seriously ill, he attempted to summon a physician by telephone and was unable to secure connection with the central station. In all haste, he went for a physician two miles away. The physician being sick, plaintiff undertook to summon another physician and failed to get connection with central. After further delays and attempts to get central, he finally succeeded, but he and the physician reached his home too late to save his dying wife. Plaintiff's right to recover was said by the Texas Court of Civil Appeals to be statutory and dependent on the inquiry whether, if the wife had lived, she could have maintained an action for her suffering consequent upon the delay in procuring the physician. The action being based on the breach of a general contract for telephone service, and no specific contract having been made as to this particular communication with the physician, the damages were held too remote, and such as could not have reasonably been in contemplation of the parties.

BRIEF NOTES CONCERNING PATENTS.

The Heany Case.

A somewhat unusual proceeding is now being conducted in the United States Circuit Court, Eastern District of Pennsylvania, in the case of the United States, complainant, vs. William W. Gibbs, John Allen Heany, Henry E. Everding, John Charles Mosser, Edward R. Sponsler and William H. Sponsler. It is charged that three certain patents issued to the defendant, Heany, in 1906 and 1907 were unlawfully and fraudulently obtained and it is asked that the Court will judge and decree that the said patents are now, and at all times since the sealing and delivery thereof, have been, null and void and of no effect; and it is further prayed that such patents be recalled, vacated, set aside and be decreed absolutely null, and that the record thereof in the United States Patent Office be expunged, erased and obliterated.

It is charged that the application upon which one of the patents was issued was changed after it was filed in the Patent Office to include elements or features not included in the application as originally filed; and it is also charged that the two other patents were issued as divisions of a fourth application, which last mentioned application it is charged had been altered after filing; and as originally filed, it is claimed, afforded no proper basis for the subject-matter of the two divisional applications. Assertion is also made that there was published in England a patent which would have been a complete bar to the allowance of such divisional applications had they stood upon their own filing dates; but by reason of said applications being divisions of an application filed less than two years subsequent to the English patent, the divisional applications were not so barred. It is alleged in the amended bill filed in the cause that it is impossible to state at this time, with absolute precision, what was embodied in the specification of the patent application, when filed, by reason of the removal and destruction of said specification and the substitution of another specification therefor.

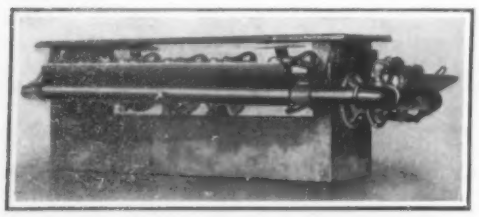
The proceedings are in immediate charge of Mr. Jesse C. Adkins of the Washington Bar, who is special assistant to the Attorney General of the United States. Mr. Frank C. Skinner, now examiner-in-chief in the Patent Office, together with Mr. Adkins, represented the Commissioner of Patents in a certain proceeding which was brought in the Supreme Court of the District of Columbia and carried thence to the Court of Appeals of the District of Columbia and in which an appeal was allowed by the Supreme Court of the United States and in which proceeding known as John Allen Heany, The Heany Company, and the Heany Lamp Company vs. Edward B. Moore, Commissioner of Patents, it was sought to enjoin the Commissioner of Patents from making an investigation for the purpose of determining whether certain of twelve applications for patents should not be stricken from the files and whether certain others of said applications should not be held abandoned as a result of cer-

tain charges made by Principal Examiner Kinnan of the Patent Office. These latter proceedings, it is understood, have been terminated in the courts without any injunction issuing against the Commissioner of Patents from investigating the matter, but of course all proceedings in the Patent Office concerning such applications, if any such proceedings are being had, are *ex parte* and not made public at this time.

An intelligent, progressive optician recently told the writer that there is not in use any effective screw lock for eye glasses; that an eye glass has four screws and no one of them has ever been held in place by any of the devices now in use. He also told us that there is not known in the trade any transparent cement that will permanently connect the sections of a bifocal. Canada Balsam is used, but will loosen under heat or mechanical jars. This had led to the expensive fused bifocals.

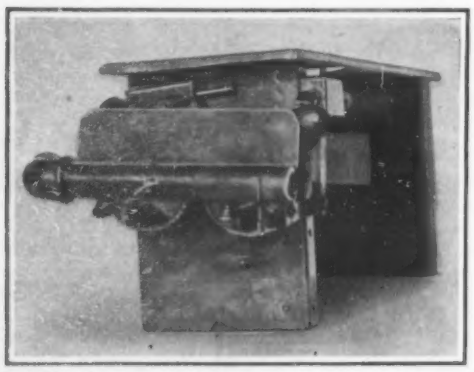
SAFETY DEVICE FOR GAS RANGES.

It frequently happens that the gas cocks of a gas range are accidentally turned on by brushing against them, with the result that a great deal of gas is liberated which is liable to explode and effect serious damage.



GAS COCK SHIELD PARTLY SWUNG OPEN.

To prevent such a possibility, an inventor has devised a shield for the gas cocks which consists of a plate of metal formed with a curved portion that fits around the gas supply pipe and an upwardly projecting flange adapted to cover the gas cocks. The portion which fits about the gas supply pipe is formed with a slot adapted to receive the body of a thumb screw on the gas pipe. By this means the shield is held on the pipe and yet may be rotated or swung through a partial arc to cover or uncover the cocks. One of our illustrations shows the shield with the flange in a vertical position completely shielding the gas cocks so that it is impossible to open them accidentally. The other illustration shows the shield partly thrown open to permit of access to the gas cocks. A spring actuated toggle mechanism is provided on each shield which serves to hold the shield either in its raised or lowered position. In addition to this the shield may be locked in position by tightening the thumb screw above referred to. The inventor of this improved method of preventing accidental turning on of gas is Maurice P. O'Donohoe of Nashville, Tenn.



SHIELD CLOSED TO PREVENT ACCIDENTAL TURNING OF COCKS.

AN ADDITIONAL PATENT OFFICE EXAMINER.

Under the last appropriation law an additional primary examiner was provided for the United States Patent Office and Mr. Edward H. Eakle has been appointed to the position, promotion from first assistant examiner to take effect July 1, 1910.

Mr. Eakle is a native of the District of Columbia, having been born in Washington in 1860 and attended the city schools and received his first government appointment as page in the House of Representatives in 1875. He entered the Patent Office as a messenger boy in 1877, resigning a few months later and going to Colorado, where he engaged in the business of sheep raising. He was reappointed to the Patent Office in 1882 to the clerical force and about six years later entered the examining corps as a fourth assistant examiner and progressed steadily through the different grades to his present position. In his course through the Patent Office, Mr. Eakle has had experience in the classes of Printing (especially with the type-setting art), Metal Working and Baling Presses, and has now been assigned to Division 11, Leather Working, including boot and shoe making machines.

He is a graduate of law and a member of the bar of the Supreme Court of the District of Columbia and brings to his new position a long experience in the Patent Office.

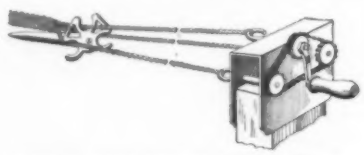
A PATENT OFFICE OFFICIAL OF LONG AGO.

Most old practitioners before the Patent Office and many of the young ones will remember Judge R. L. B. Clarke who for many years was on the Board of Examiners-in-Chief. He was appointed an examiner-in-chief on April 23, 1869, and remained in such position until March 31, 1895.

He is now in his ninety-fourth year and is unusually well preserved, being frequently seen on the street and in the cars of Washington entirely unattended.

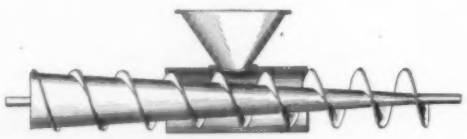
ODDITIES IN INVENTIONS.

Device for Making Rope.—For the benefit of farmers and other persons requiring halter ropes, tethering ropes and the like, a simple rope-making machine has been devised capable of making a rope of any size or length in common use. As our illustration shows, the device is adapted to be mounted on a suitable support such as a fence post. It consists of an inverted U-shaped plate in which are fitted three shafts provided at one end with hooks and at the other with sprocket wheels adapted to engage a chain. The rope is made up of lengths of twine doubled upon themselves and attached to the hooks. By means of a crank the hooks are rotated, winding up the twine. After the twine has been twisted to the desired tension, the strands are guided by means of a guide, which is moved manually forward as the machine is operated and which controls the tightness of the rope.



ROPE MAKING DEVICE FOR HOME USE.

Adjustable Apparatus for Measuring Grain and the Like.—A very ingenious method of feeding grain from a hopper is illustrated herewith. The rate of delivery may be adjusted at will in a very simple manner. The device consists of a conveyor screw, the body of which is tapering, but the thread or helix of which is of uniform pitch. Mounted to slide along this screw is a casing provided with a hopper. The casing rests on the screw so that the shaking or jarring due to the action of the screw will assist in feeding the material from the hopper. By moving the casing along the screw the amount of material delivered by the screw may be varied, for it will be observed that the holding capacity between the threads gradually increases from the left-hand end to the right-hand end of the conveyor.

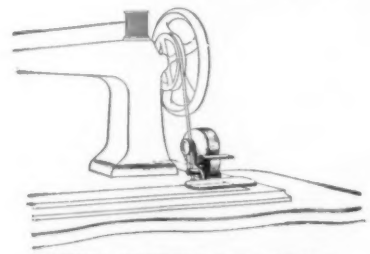


ADJUSTABLE MEASURING HOPPER.

Cigar Holder for Hats.—A very unique device for holding cigars has recently been patented. It consists of a plate of sheet metal formed with bent up ears at intervals between which cigars may be secured. The plate is flexible and is adapted to be fitted within the crown of a hat. In order to provide for different sizes and shapes of hats, extension pieces are used which make the plate adjustable. This method of carrying cigars about one's person is an improvement on the common method of placing the cigars in a case, which is usually too bulky to be carried about in the pocket conveniently.

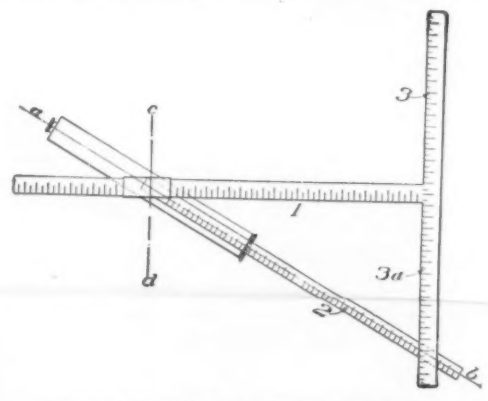
CIGAR HOLDER FOR HATS.

Scissor Sharpening Attachment for Sewing Machine.—A very simple attachment for sewing machines has been invented which consists of a small grinding wheel mounted in a bracket which may be secured to the base plate of the machine. The belt of the sewing machine passes over a pulley carried by the grinding wheel and a small roller serves to press the belt against the pulley so as to produce the requisite frictional engagement between the two. The device may be very quickly applied to a machine and used for sharpening scissors or any other small tool or implement.



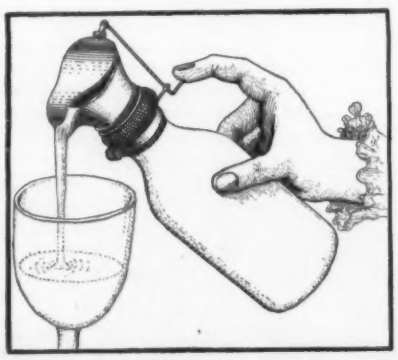
SCISSORS GRINDING ATTACHMENT.

Farm Surveying Instrument.—The accompanying engraving shows a simple instrument intended primarily for irrigators, but useful also for farmers, ranchers, loggers, miners and others who often have need of a simple instrument for rough surveying. It consists of two parts, a graduated T square with level bubble, slidable horizontally, pivotally connected to a stadia transit bearing a third graduated arm. The principle involved is, of course, that of similar triangles. The instrument should be set up on a high point, giving a view of all the points to be located. The direct oblique distance to any given point is then ascertained by stadia method—the rod being held at right angles to the line of vision. Then the T square arm is slid out until lower arm *3a* intersects arm *2* at the distance obtained by stadia method. This completes a similar triangle. The horizontal distance to the given point will be *1*, and the difference in elevation between it and instrument height, *3a*. The simplicity of the instrument renders it practicable for the use of outdoor men with no technical training, who may want to do some rough surveying, without being put to the expense of a regular survey.



DEVICE FOR MEASURING VERTICAL ANGLES.

Pitcher Attachment For Milk Bottles.—An inventor who hails from Alabama has conceived a very unique attachment for milk bottles, consisting in a pitcher-like mouthpiece which enables the milk to be poured out without spilling or running down the outside of the bottle. The mouthpiece is made fast by means of a rubber sleeve and a collar. The mouthpiece is also fitted with a spring-pressed cover of the type usually found on syrup pitchers, and this may be opened by operating a finger piece, as indicated in the illustration.



PITCHER ATTACHMENT FOR MILK BOTTLES.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

COLLAR-FASTENER. — C. TOMPSETT, Omaha, Neb. The more particular purpose in this case is to provide a flexible, reversible collar fastener constructed of a single piece of material, comprising a central tongue to secure the fastener to the shirt band, and a second tongue integral with the fastener and adapted to securely hold the collar in place and prevent the same from riding the shirt band.

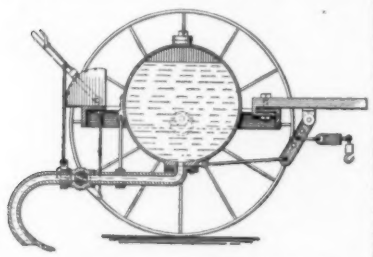
Electrical Devices.

ELECTRICALLY-OPERATED SWITCH.—J. A. LUNDEEN, Edgewood Park, Pa. This invention comprehends an electrically-operated lever to be connected with a valve or the like, to be actuated occasionally in one direction when one circuit is closed and in the opposite direction when another is closed. It also comprehends means controllable at will for adjusting the play of the aforesaid lever. The operator has means to adjust within reasonable limits the travel of this lever and consequently the travel of the valve piston. In doing this, he may regulate the travel of fluid through the pipes.

Of Interest to Farmers.

SHEPHERD'S HOOK.—H. E. NEWMAN, JR., Shoshone, Idaho. In this patent the aim of the inventor is the provision of a device wherein the hook may be closed by a latch, and wherein the latch may be locked in open position, and released by the engagement of the hook with the leg of the sheep.

IRRIGATION CULTIVATOR.—E. F. DOUGLAS, Weskan, Kans. An ingenious machine is shown in the accompanying illustration whereby the soil may be cultivated and irrigated at the same time. By reference to the illustration it will be observed that the plows of the machine are formed of tubes which

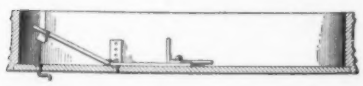


COMBINED IRRIGATOR AND CULTIVATOR.

communicate with a large reservoir. The latter may be filled with water or with some fluid of a fertilizing character. When the operator of the machine so desires, he can throw open a valve which will permit the fluid to run into the furrows.

Of General Interest.

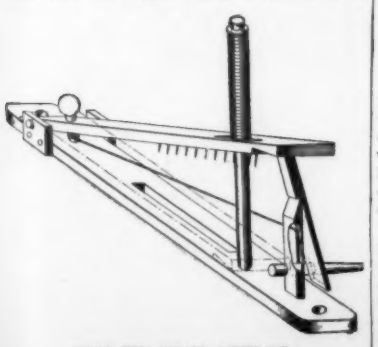
ADJUSTABLE BOTTOM FOR BURIAL CASKETS.—THOMAS A. LYNCH, 969 East 167th Street, New York City. The accompanying illustration shows a section of a burial casket provided with an adjustable bottom which may be manipulated to support the



ADJUSTABLE BOTTOM FOR BURIAL CASKETS.

corpse in various positions. The adjustable bottom is formed of two leaves hinged together, one of which may be raised to elevate the shoulders of the corpse, or if desired, both may be raised to place the entire body in an inclined position. This would be of advantage in case of the corpse lying in state or on exhibition for inspection by a considerable throng of people. A device is provided to prevent the corpse from being displaced by slipping down the incline.

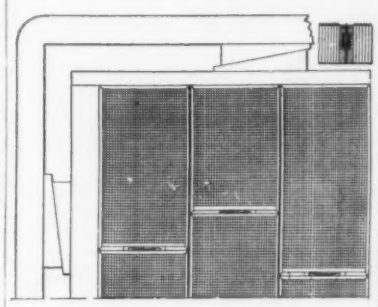
AN ANIMAL TRAP.—H. R. ARBUCKLE, Wanette, Okla. The trap, which is illustrated herewith, is peculiarly adapted for catching coons and minks along streams and rabbits in orchards. The trap may be set on dry land, where it is not liable to freeze, and is so constructed that when the animal comes in contact with the trigger string, a spiked beam



TRAP FOR SMALL ANIMALS.

falls upon it and kills it. The beam is pressed down by a coil spring and when the trap is set, is supported by two bars held together by a notched pin. The notched pin is withdrawn from engagement with the two bars when the animal comes in contact with the string.

RETAINING-SLUG FOR PRINTERS' TYPE-FORMS.—JACKSON STIVERS, 644 Twelfth Street, San Diego, Cal. Preparatory to securing printers' forms in the chase, ready for the press, it has been the custom to remove the page cord, bound about each form, so that the slugs of the several forms could be brought flat together when the forms are clamped in the chase. As many of these forms are kept

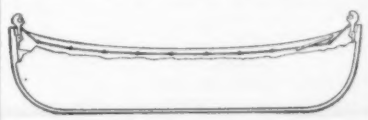


RETAINING SLUG FOR TYPE FORMS.

from time to time, it is necessary that they be re-tied when they are removed from the chase. To avoid this and afford a convenient means for securing the ends of the cord so that there will be no knots to interfere, the slugs are provided with grooves as shown in the small sectional view, which pass continuously about the forms, and also have grooves passing from the continuous groove for tying the cord ends.

Hardware and Tools.

BOAT RELEASING HOOK.—J. Y. PORTER, Knights Key, Fla. When launching boats such as lifeboats on a seagoing vessel, the hooks by which it is suspended must be capable of being released at the moment when the boat strikes the water. To permit of this instantaneous release a novel hook has been pro-



BOAT RELEASING HOOK.

vided in which is a retaining finger adapted to lock the hook in a closed position. The finger is furnished with a latch which may be released by pulling a rope so that the finger may swing open and a heel formed thereon will force the falls out of engagement therewith. By this arrangement, a single cable may be operated to effect a simultaneous release of both hooks.

REMOVABLE SAW-HANDLE.—J. J. WEISS, New York, N. Y. This invention provides a handle wherein the adjustment of said handle on the blade clamps the same; provides means for locking the blade in clamped position; provides means for compensating for wear of the clamping members; provides means for adapting the handle to clamp blades of varied thickness; and provides a universal single handle for a plurality of saw blades.

CURTAN-FIXTURE.—H. REUBEL, New York, N. Y. The purpose of this invention is to provide a fixture arranged to permit convenient attachment to the door or window, for attaching the curtain-supporting member in position on the keepers fixed on the door or window, and for removing the said members from the keepers with a view of placing the curtain in position or removing it therefrom.

LEVEL.—J. L. RUSSELL, Albion Cal. This invention is in levels of the character disclosed in a former patent granted to Mr. Russell, embodying transparent tubes connected together at their lower ends by a flexible tube, the whole being sufficiently filled with a liquid to stand in both tubes at the same time. The present invention is a level of the same construction operable by one person, even though the view be obstructed between two accessible points between which the level is taken.

Heating and Lighting.

GLOBE OR SHADE HOLDER.—A. KRATZL, New York, N. Y. The object here is to provide a holder for globes or shades used in connection with any fixture, by means of which the globe or shade can be securely held in place, or to release the same, and which can be used in connection with light fixtures of different kinds.

OIL-BURNING HEATER.—P. LISIENIECKI, Drohobycz, Galicia, Austria. In this instance the invention is an improvement in the class of heaters or stoves adapted for burning crude oil or any other liquid combustible which is of a suitable character. The regulation of combustion may be effected manually. Means are provided, so that the supply of air to support combustion is always proportionate to the amount of oil delivered upon the dampers.

Household Utilities.

MATTRESS.—P. KLIMOWICZ and J. S. WORZALLA, Stevens Point, Wis. The present patent is a mattress of the same general character as one formerly granted to the patentees, in which the groove is provided to receive the shoulders, arms, etc., with the groove filled with one or more removable cushions having filling relatively softer than the filling of the mattress, each cushion being constructed of two sections spaced apart and connected together by an intermediate pad, the same affording lateral support to the shoulder when lying on the side, and support for the neck when on the back, the pad seating on an elastic web bridging a contracted portion of the groove.

Machines and Mechanical Devices.

DYEING-MACHINE.—W. A. FOWLER, Salisbury, N. C. The material to be dyed may be compressed to eliminate liquid in the machine in which it is subjected to the dyeing fluid; after being dyed it may be submitted to heated dry air, within the chamber in which dyeing was effected; the dyeing fluid is introduced to the material treated and in the center thereof; and the invention provides a driving mechanism whereby the pressure mechanism and the dye injecting mechanism are arranged to utilize the same motor.

FLYING-MACHINE.—C. B. CRONAN, Shelburne Falls, Mass. The details of construction enable the vertical ascent of an airship by contained mechanism, effect its progressive movement laterally in any direction and at any speed within the capacity of the mechanism; further, they permit the ship to be raised vertically to any height desired, be held stationary while at any desired point, and be controlled in descent so that jar or shock from contact with the earth is neutralized.

Prime Movers and Their Accessories.

ROTARY ENGINE.—R. LUNDQUIST, Laguna De Terminos, Mexico. This invention relates more particularly to that type of engine disclosed in a prior patent granted to Mr. Lundquist. An object is to provide a rotary engine with a rotor having a plurality of pockets containing buckets extending in opposite directions, whereby said rotor may be propelled in either direction.

Railways and Their Accessories.

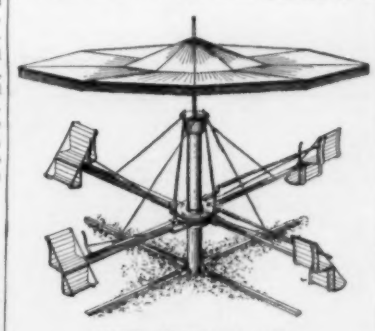
FOOT GUARD FOR RAILROAD SWITCHES, ETC.—THEODORE A. PETERSON, Benton Harbor, Mich. Accidents are of frequent occurrence at switches and frogs on railroads, due to the fact that trainmen are liable to get their feet caught in crossing the tracks. To prevent such accidents, the construction shown in the accompanying engrav-

FOOT GUARD FOR SWITCHES.

ing has just been invented. It consists of a corrugated metal ribbon which is inserted between the rails and offers a firm support for the foot, providing at the same time a brace for the rails between which it is fitted. Owing to the open construction of the support, dirt or gravel falling between the rails will not lodge on the foot guard.

Pertaining to Recreation.

ROUNDABOUT AMUSEMENT APPARATUS.—A. E. MENDENHALL, Tilden, Nebr. The apparatus consists of a type of merry-go-round so designed that the passengers may propel and control the rotary movement. A central post around which the carriage support is arranged to rotate on anti-friction rollers is provided with a ratchet wheel adapted to be



NOVEL MERRY-GO-ROUND.

engaged by pawls mounted on levers. The levers project in front of the seats mounted on the carriage and may be operated to propel the carriage about the post. In addition to this, a set of brakes is provided, one for each passenger.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

(12273) F. E. says: Kindly tell how does science explain the law of gravitation? Why do all bodies attract or repel each other? Why moon has influence upon tides. Can that be explained by opposite electrification of these two planets (moon and earth)? A. No explanation for the fact of the gravitation of matter has ever been found. We cannot tell why all bodies attract or repel each other. We know that they do. The attraction of the sun and the moon upon the waters of the earth produces the tide. There is no reason to suppose that electricity has any part in the production of tides. On the side of the earth towards the moon, the water is nearer the moon than the solid earth, and is attracted more than the earth. This lifts the water up in a tide. On the opposite side of the earth, the reverse takes place, and the earth is drawn away from the water, leaving it raised in a tide.

(12274) M. L. S. says: I need some information on magnets; can I rewind, say a four-ohm telegraph sounder, to one hundred and fifty ohm? Will I have to have a larger yoke to connect the magnets, and a larger piece on the sounder arm? Will the magnet cores be heavy enough? What size wire and how many feet will it take? If I cannot get 150 ohm how many can I get. I would like to have 50 or more. I want to work it on a telegraph line without a relay. A. We cannot tell you whether you can rewind your sounder for 150 ohm or not, but you can determine the point for yourself by the use of a wire table. Measure the length and depth of the space into which the wire is to be wound. To make the resistance 150 ohms, which is about forty times 4 ohms, you must select a size of wire with ten times the resistance per foot, and use about four times as long a piece, or five times the resistance per foot and eight times the length as on the magnet at present, or some similar relation. The wire table will give you the thickness of all sizes from which the number of turns in a layer and the number of layers in the magnet can be calculated. You can in this manner by several trials find the size which can be used and will give you 150 ohms on the magnet, if it is possible to get that quantity into the space at your disposal. There are wire tables which give the length of wire which can be wound into a cubic inch for the various sizes of wire. The new edition of Underhill's Electromagnet, price $2, contains tables to facilitate such calculations. We shall be pleased to receive your order for the book. You can probably use the same cores and armature as at present.

(12275) J. A. H. says: I have a prospect that assays eight feet down 9.4 W. at 12 feet 16 per cent, at 18 feet 22.4, at 22 feet 34.5 per cent. Thinking it a paying proposition, would like to know if there is any smelter where they will smelt tungsten ores? What is it worth? Where will I find any full account of its uses and treatment, etc.? A. Good articles on the use and value of tungsten appeared in SCIENTIFIC AMERICAN SUPPLEMENT Nos. 1516, 1660, 1777, and 1795, the price of which is ten cents each. We suggest that one of the mining engineers of Butte or Anaconda in your State would be available for information and an opinion on the value of your prospect. If you have difficulty in finding a local engineer who seems competent, let us know and we can perhaps suggest one in the East.

(12276) T. J. W. asks: Will you kindly tell me what sort of thermometers are used by explorers and in balloons for measuring temperatures below the freezing point of alcohol? A. Common alcohol is used in thermometers for measuring temperatures of the air below the freezing point of mercury. Mercury freezes at 40 deg. below zero, Fahr. Alcohol freezes at 202 deg. below zero, Fahr. The lowest temperature recorded on the earth was about 90 deg. below zero, Fahr. This is more than a hundred degrees above the freezing point of alcohol. In scientific work hydrogen or platinum thermometers are employed for very low temperatures. The platinum thermometer is used for very high temperatures.

NEW BOOKS, ETC.

THE GRAPHIC ARTS AND CRAFTS YEAR BOOK, 1910. Joseph Meadon, Editor, Hamilton, Ohio. 4to.; 350 pp. Price, $5.

This is the American annual review of the printing, engraving and allied industries. It is beautifully printed on deckle edge paper and is filled with the most beautiful reproductions of all kinds. To the technical worker in

photo-engraving, and particularly the color work, it will prove of inestimable value. The present volume displays a very wide range of treatments, processes and methods of reproduction.

The editor apologized for the fact that in the present book it is not possible to observe consistently the nice formalities of bookmaking. This apology is not, however, necessary, as the make-up is most admirable. That the engraving and printing provisions are evolutionary by nature and revolutionary in effect is demonstrated by the march of events as the years roll by. There may be nothing startling to chronicle, but each year shows an improvement in some operation, method or material, and as change follows change in a few decades the process or means employed in the process presents entirely different problems.

Considerable attention is given to the question of costs. This is a most important one, and one which photo-engravers seem to have disregarded to their sorrow in the past.

The book is a very beautiful one, is tastefully bound in half morocco. The present is the fourth volume of Issue.

YOUR HOME AND ITS DECORATIONS. Compiled and published by the Sherwin-Williams Company. New York: John Lane Company, 1910. 8vo.; 204 pp. Price, $2 net, postage 15 cents.

The determination to publish a book of real assistance to the home builder has placed it on a different plane from other publications of this character. Much has been written on the subject of home decoration, and in almost every instance one vital point, practicability, has been wanting. Many of these publications are full of glittering generalities, from which very few of us can gather applicable points on decoration. There has been a continual beating round the bush, trying to give information without supplying anything specific. The Sherwin-Williams Company have endeavored to eliminate this difficulty in the book before us. They come out boldly and specify certain products of their manufacture which are necessary to produce certain effects. The result is a work of real merit. It is artistically printed, the methods of illustration being half tones and color plates. Even the subject of Oriental rugs is thoroughly taken up.

RADIUM. By J. P. Lord. Third edition. Pp. x + 103. London: Harding Bros. & Co., 1910. Price, $1.00.

Dr. Lord in his preface states that his object in writing this book was "to steer a middle course between the popular and the scientific literature on this subject, avoiding over technicality on the one hand, and on the other, that looseness to which the popular treatment of a scientific matter is peculiarly susceptible." The book seems to have attained that object in the main. Among the slight inaccuracies to which we desire to call attention are those which appear in the discussion of the energy of radium, and in the statements of the high price of radium. The most valuable part of the book is the description of the radium mines of radial active ore, and the medical uses of radium.

OPTICAL INSTRUMENTS SIMPLY EXPLAINED. By H. T. Davidge. London: Percival Marshall & Co. 16mo.; 83 pp. Price, 25c.

This small book is designed to give the reader thorough information on the subject, and is well gotten up.

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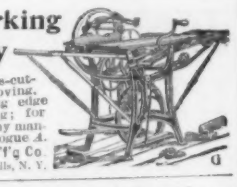

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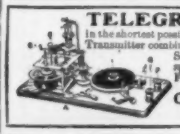

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THE PARSEVAL AIRSHIP.

(*Continued from page 124.*)

chines. There are, of course, two motors. To insure the highest possible economy when only one motor is running there is a coupling arrangement by which two propellers in tandem may be driven by either motor alone. The girder construction of the hubs has been fashioned into a mechanism that permits altering and even reversing the pitch of the propellers while they are running. This is done by a convenient hand wheel at the side of the car. The pitch is always adjusted to the most economical number of the motor's revolutions. With one motor driving both propellers the pitch is lowered until the propellers run quite as fast as with two motors.

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(*Continued on page 134.*)

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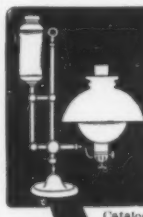

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(Continued from page 133.)

position. There is, of course, in addition to the usual barograph, barometer, statoscope of the spherical balloon, also an air bubble to indicate the "tilt." The frame of the car is made of steel tubes and T girders, covered with wire netting and heavy canvas. A large cylindrical gasoline tank in a cloth casing serves as a back to an elegant bench upholstered in red leather, running across the car, and dividing it into a "bridge" and "engine room." This bench accommodates six passengers. For the pilot and his aides there are camp chairs. The spacious engine room, with the smart iron railing around the motors, differs in no sense from that of a boat, even as to its minute cleanliness. The motors are of the six-cylinder type, each good for 120 horsepower maximum. They were selected after a competition and have never given trouble. The radiators, arranged like an inverted V, close the car in the rear. They are of aluminium, very imposing, each about five feet square, but quite light. Cooling is effected by powerful blowers set in a casting. These spread the blast evenly over the whole radiating surface. The motors are cranked with the throttle almost closed and the propellers are thrown in by clutches.

The rigging is as elaborate and picturesque as that of a clipper ship. It was found that anything could be attached directly to the gas bag, to reinforcing "patches," which doubled and trebled the thickness of the cloth. There is an "equatorial belt" carrying the suspension, and there are many other "patches," some of them shaped like a star, to hold a single rod. The stablizing fins are now made of steel frames covered with cloth on both sides. The "air mattress" idea has been dropped, but the cloth is still kept from fluttering by allowing the wind to catch in a "mouth" and blow between the two layers. The tiller rope ends in a steel band that fits around a large semi-circular pulley fastened to the rudder. This insures precise action. The stablizing planes are held in place by a very simple and strong arrangement of rods and stays fastened to the envelope as described above. The suspension branches back with innumerable "crows' feet" (the original ones made of three loops of rope each, sewn to the equatorial belt) from many short hemp ropes into fewer and fewer wire ropes. Everything is flexible. All loops are lined with fittings of aluminium or steel, allowing the ropes to slide with little friction and preventing excessive wear and tear. The car, with four grooved wheels, rolls on two strong inclined cables of twisted steel wires, into which most of the branch ropes finally consolidate. But at the same time it swings like a pendulum with parallel motion from six vertical ropes.

A Parseval's handling is nearly as simple as that of the ordinary round balloon. It has been inflated in the open, and it can be landed, by valve and ripping cords, with safety, with disabled motors in a storm. There are many "handling ropes," each with a series of loops, giving a firmer grip. They hang down from the whole length of the bag and are an integral part of the rigging.

At Frankfort in 1909, during the International Aeronautic Exposition, where the ship ascended, one of these dragging ropes coiled around a man's legs and raised him into the air like a feather, although the balloon had no surplus lift. Thus the lifting power of the propellers and the tilted hull was forcibly shown. The ship was always actually heavier than the air when it left the ground in a slanting direction. Coming down was harder than going up. The consumption of fuel lightens the ship, and it is considered "unsportsmanlike" to let out gas. The low center of gravity, in spite of the flexible suspension, prevents a tilt as sharp as that of the Zeppelin III," which swoops down like a hawk. The "Parseval III." must "screw itself down" in many spirals. On one occasion, in bright sun-

(Concluded on page 135.)

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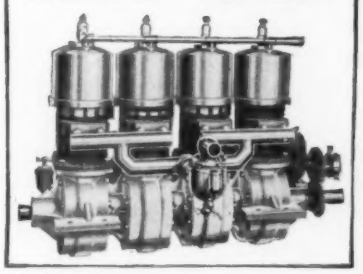

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(*Concluded from page 134.*)

shine, it could not come down at all, much to everybody's amusement.

At Frankfort, where the Parseval system was permanently represented by its largest and most serviceable type (6,600 cubic meters, or 223.079 cubic feet, displacement) comparison with the "Zeppelin II." and "Zeppelin III." by visitors at the exposition could easily be made.

The virtues of the Parseval system are so obvious and simple that they can be easily understood from theory. With the Zeppelin system it has been mostly results that counted with the public. Like the Wright flyer among aeroplanes, the Zeppelin among airships has gone farthest and fastest with the lowest power and the least consumption of gasoline and oil. It has lived through the change from night to day and day to night and morning again in a single trip without stopping. It is well known how much less gas these changes in temperature and height would have meant for an airship made like an ordinary balloon. Still, compared to the Parseval, which may be said to have practically reached the pinnacle of its development, the Zeppelins may not have half realized as yet the inherent advantages of a rigid construction. They had to pay the full toll for their "extravagant" mode of handling, but did not nearly enjoy the full recompense. The Parseval is the airship of to-day, the Zeppelin that of the future.

The fundamental difference between the two systems may be stated thus: The Parseval, with its sharp distinction between "car" and "balloon," always remains a "unit," more or less. A Zeppelin, in larger sizes, becomes purely a conglomeration. A Zeppelin's weight, therefore, increases at a lower rate than its lift. The "Deutschland" points the way to the giants of the future, with no cars, but a continuous "hold" and the load everywhere directly under the gas that lifts it. A Zeppelin may also have an "upper deck." It is there already; for on the uppermost "strake" a man may now safely walk from end to end after having ascended through the hull. A few thin boards and a light aluminium railing will complete it.

The Parseval ships at present are built in the following dimensions:

Displacement, Cubic Meters.	Length, Meters.	Maximum Diameter, Meters.	Maximum Width Over Fins, Meters.	Car Length, Meters.	Width, Meters.	Height, Meters.	Speed, Meters a Second.	Endurance, Hours.	Height Obtainable, Meters.	Passenger Capacity.	Needed for Handling the Airship, Men.
Type A, 4,000.....	60	10.4	16.0	0.6	1.3	1.2	18	15	2,000	6	3
Type B, 6,000.....	70	12.8	17.0	1.0	2.0	1.4	14	20	2,500	10-12	3 or 4
Type C, 2,000.....	50	8.6	14.0	5.5	0.6	1.1	11	8	1,000	4	1 or 2
Type D, 1,200.....	40	6.7	12.0	4.0	1.3	1.0	9	5	600	3	1 or 2
Type E, 3,200.....	60	9.4	15.0	7.0	1.8	1.2	10	6	1,500	6-8	3
Type F, 1,000.....	45	8.2	12.5	5.5	1.0	1.0	8	5	600	3	....

Types A and B have two propellers and two motors. They are so far, perhaps, the only craft completely immune from failure of the power plant.

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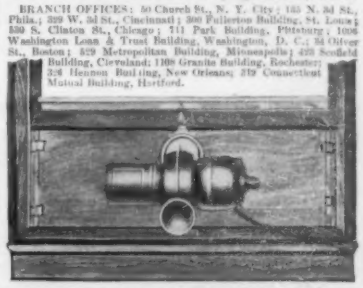

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The Cadillac principle, faithfully followed all these years, is this—that any one of ten thousand or more Cadillacs should be interchangeable in its parts with any other Cadillac of the same type.

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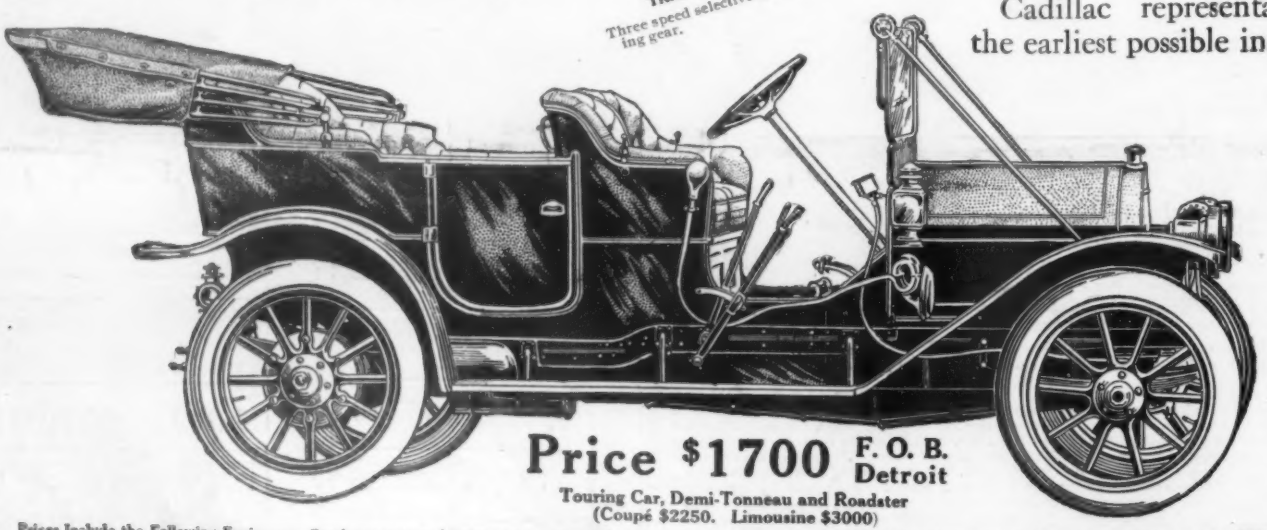

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